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ESTIMATION OF VITAL RESISTANCE OF PATIENT WITH REFERENCE TO POSSIBILITY OF RECOVERY.*

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THE art of surgery is further advanced in the estimation of the vital resistance of the individual or the factors of safety than the science of surgery. Our instruments of precision are limited and our methods of exact estimation of function are few. In addition, even with these, the average surgeon has not had much experience.

For the estimation of the factors of safety during operation and the condition of the patient directly after operation, it is my opinion that the blood-pressure apparatus is the most important. In the last year I have attempted to record blood-pressure measurements before, during, and after all operations, with the result that I have found these records the most important method of estimating the exact condition of the patient. Before operation the blood-pressure cannot always be depended upon as an index of the vital resistance.

The estimation of the function of the kidney is next in importance. I cannot in this short discussion consider the

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details, but it is my opinion that this functional test should be made as often as possible before operative intervention.

Every surgical operation is a depressant in relation to the so-called vital resistance of the individual or his factors of safety. It is a weight to be borne or carried. All the factors of the intervention summed up must be less in their burdening capacity than all the factors of safety or vital resistance in their carrying capacity, or the patient dies.

It is my opinion that surgeons must divide operations, first, into two great classes: those which are for the relief of conditions which of themselves are producing at the time little or no depression of the individual, and for conditions which are of themselves depressant. In the first group, therefore, the operation adds a burden but takes none away, while in the second group, although the operation itself burdens for a time the individual, yet it relieves the individual of a burden which he was carrying before the operation.

Some examples will make this most essential distinction clearer. A man with an ordinary inguinal hernia retained by a truss is practically free from any discomfort, burden, or depression by such a hernia. The operation will bring no relief in that sense. The successful operation will allow him to discard his truss and relieve him of any danger of future strangulation. Such an individual, in apparently perfect health from the ordinary pre-operative examinations, may be made very uncomfortable by the operation for the relief of the hernia with the ordinary pre-operative treatment and ether anæsthesia.

The same individual with a strangulated inguinal hernia will exhibit after operation less evidence of depression, because the operation relieves the patient of pain, of nausea and vomiting, and of the toxæmia present in all cases of intestinal obstruction. It is possible that the burden imposed by the operation may be less than the burden previously carried by the patient. In such a case, at the end of the operation the patient's vital resistance is greater than before. I have frequently observed such a condition of affairs in

early intervention for typhoid perforation, acute hemorrhagic pancreatitis, and perforation of gastric ulcer.

It is very important, therefore, for the surgeon to investigate the individuals who are to be operated on for lesions like non-strangulated hernia with unusual care, and so plan the operation and anæsthesia for the relief of this condition that the burden is kept well within the factors of safety.

Progress of surgery must be developed along lines in which not only the operation gives immediate relief, but the patient recovers and the probability of the permanent cure is increased.

Pre-operative Treatment.—In this period the diagnosis is made, and the patient is prepared for operation. It must be settled: first, that the patient has a local condition for which an operative intervention gives the greatest promise of an immediate and permanent cure; second, that the general condition of the patient is of such a character that the burden of the necessary operation for the relief of the local disease is well within lines of safety. This pre-operative period varies in time. When the local disease threatens life there is no time for any preparation. Here the danger of delay is greater than any danger of the operation. The risk must be taken. In emergency surgical cases the only question, therefore, to settle is whether the danger of delay is greater or less than the danger of the operation.

In all cases in which there is no danger from delay there is afforded further time for studying the general condition of the patient and estimating the factors of safety.

In the past, both in medicine and surgery, too much attention has been focussed on the local lesion and not enough on the general condition of the patient, and it is for this reason that we are not prepared to-day to estimate with a sufficient degree of certainty the vital resistance of the individual.

The factors to be considered are the individual, which means the general condition; the disease, or the local condition; and, last, the operation for the relief. In the pre-operative period of investigation and treatment we study the individual. The blood count is a scientific estimation of the

presence or absence of anæmia, and we know that different types of anæmia and leucæmia lower the vital resistance. By the ordinary methods of physical examination we can estimate to a certain degree the circulation and respiration. Lesions here are risks of different degrees, but to-day we have no unanimity of opinion in regard to the operative risks on patients suffering with various types of cardiac lesions and lesions of the lungs.

With nitrous-oxide-and-oxygen anæsthesia my accumulated experience leads me to the conclusion that it is not harmful in lesions of the heart and lungs, that the element of danger in operations upon such individuals is more the operative intervention than a general anæsthesia of this kind.

Certain general conditions undoubtedly decrease the vital resistance or factors of safety, and they are well known: mechanical or psychic shock, general infections and toxæmia, metastasis from malignant disease, cerebral pressure, anything that interferes mechanically with respiration, and a weak cardiac muscle with dilatation of the heart. These general conditions are not so difficult to diagnose as to estimate how much of the factors of safety they have removed and what there is left with which the patient may withstand the contemplated operation.

During this period the estimation of the function of the kidney should be done.

In view of the fact that at the present time our scientific methods of accurately estimating the vital resistance of the patient or the factors of safety are to a certain extent so unreliable and the factors themselves so numerous and the problems so complicated, it is my opinion that every patient should be given the benefit of every doubt and prepared for the operation with the greatest care, that the operation be performed under the least dangerous anæsthetic, that the manipulations of the operation be made with the least degree of trauma and loss of blood, and that the post-operative treatment be planned to reduce as far as possible any depressant factors and to give the patient the benefit of any improvement in treatment.

As far as possible, therefore, all patients should be treated, without their knowledge, as if they were very ill. These handicapped patients are comparatively few in numbers, and if we wait and employ this more difficult technic for this group only, I am certain that the development of the technic will be very slow.

Take nitrous-oxide anæsthesia, for example. We have been getting along very well with ether given by the drop method on the open cone, and for the ordinary healthy individual and for the ordinary operation it is good enough. But for the handicapped individual, and especially for an extraordinary operation upon one of this class, nitrous-oxide anæsthesia is far less dangerous than ether. But no clinic can develop the technic of this narcosis if it is selected for the handicapped cases only. Everyone must be narcotized with it, and it will soon be found that nitrous-oxide anæsthesia with its various combinations is better for all patients. It is pleasanter to take, the post-operative discomforts and dangers are distinctly less, and for extraordinary operations on healthy individuals and any operation on the handicapped individual it is life-saving

This, therefore, is the second point of this paper: the development of a course of treatment before, during, and after operation to be employed in all cases, which has for its object the reduction of the risk and of the discomforts of operative intervention. Not until this is done will any surgeon or any clinic be able to estimate what is the best method of treatment. There is no doubt that every operation to-day has its mortality; post-operative discomforts, complications, and deaths are still observed. Then there are the late post-operative lesions, usually of the nervous system, so-called neuroses. The facts, therefore, justify my statement that we have by no means reached our best method, either of estimation of the vital resistance or of a method of treatment which will reduce the operative risk to a minimum, but we have made great strides toward this. In brief, they are as follows:

Greater care and more time should be spent in the study

of the local disease and in the investigation of the general condition of the patient. Emergency operations should be performed earlier and operations which are not of this type should not as often be undertaken without the proper pre-operative study and treatment.

In the pre-operative diagnosis, instruments of precision should be employed—the X-ray, the blood-pressure apparatus, all of the clinical and laboratory examinations should be made; the patient should pass through this in such a way that no fear is excited and that it does not become an ordeal. During this period of diagnosis, therefore, treatment is by no means neglected. In the first place the psychic condition of the patient must be borne in mind, everything should be done to allay fear, establish confidence, in fact give mental rest and recreation. Next should be considered the emptying of the intestines by proper catharsis, the pre-operative diet. The details of this I cannot discuss, but every essential feature should be carefully investigated. It is my opinion that the patients are more comfortable if they have no cathartic later than 36 to 48 hours before operation, and that in all abdominal cases they should have no food except water and albumin for 48 hours. This treatment, of course, varies with the individual, with the disease, and with the general condition. The longer a patient can be free of alcohol before an operation the better. Very fat people should be starved for some days; the diabetic patient should not be starved. With lowered renal function the patient should be given rest in bed, restricted food, plenty of water, and a permanent catheter in prostatic cases.

There are many factors to be considered in a pre-operative treatment for those cases in which the operation is not an emergency one. In general it is my experience that as a rule certain things are neglected in the majority of cases. These are the more careful investigation of the general condition of the patient, the estimation of the kidney function, and the blood-pressure record. I am quite certain that an investigation of this kind will not add to the anxiety of the pa-

tient. It no doubt adds to the burden of the surgeon and his associates, and to the expense to the individual in the hospital, but the time is fast coming when the individual who can afford to pay for it will expect and demand these more modern, more exact methods of diagnosis.

Every hospital should be sufficiently endowed so that its public patients may have the benefit of these methods of exact diagnosis. The time will come when a Wassermann blood reaction will be made as often as a blood count. In the past these methods of diagnosis have been underdone, and in the future, I am confident, it will be better to err on the side of overdoing.

What preparation will increase the factors of safety? I am confident that certain general rules in regard to ordinary daily life can be utilized. After any work there is fatigue and for recuperation there must be rest. This physiological law is well established. The work of the cell, whether of the nerve, muscle, or gland, is accomplished by a chemical reaction in which the cell gives up something of its vital energy. During the period of activity energy is expended and not stored, so that there must be a period of rest to restore the cell to normal. If work is continued without the proper period of rest, the cell in time becomes incapable of restoring its energy and may be looked upon as a dead cell. Of course there is every grade of exhaustion from the early fatigue to the dead cell.

The individual who is but a combination of such cells may be looked upon by the surgeon as a physiological unit, a cell; and the first question to answer is, How much rest does this individual need before he is subjected to operation? This period of rest depends upon whether the patient, physically or mentally, has been overworked, and in what stage of exhaustion are his cells, especially the brain cells and the cells of his excretory organs. Now, as a matter of fact we have no scientific method of estimating this. If we can come to the conclusion that the disease itself is not increasing the degree of exhaustion, then there should be a delay to give the patient

physical and mental rest. We all know that rest, mental and physical, is a difficult thing to give the ordinary individual at his home. It is best accomplished with the majority of cases at the hospital. There are, of course, exceptions to this rule. The next important factor in the pre-operative treatment is fresh air. It is very difficult, especially with most of our patients, who have become accustomed to the overheated, close atmosphere of most homes and office buildings, really to keep them at rest in fresh air.

Most individuals over-eat. Therefore, the intestine should be freed by cathartics and the diet should be restricted. Water should be given in larger quantities. There is no doubt, it seems to me, from the experience in the literature and from my own, that alcoholics should be total abstainers before operation.

Now, practically all surgeons are agreed as to physical and mental rest, as to fresh air, as to restriction of food, as to the increase of water, as to the cutting out of alcohol and tobacco, before operative intervention. For the ordinary healthy individual the period may be short, 48 hours, the time increasing after this according to the individual and his handicap. But the point I wish to emphasize here in conclusion is this: Surgeons have not made a careful, scientific investigation as to the best pre-operative treatment for all patients, and especially for handicapped patients, and, more important, for the different kinds of handicap. How shall the patient with myocarditis be prepared? Undoubtedly in the same way that the physician would treat his heart lesion, whether he is to be operated on or not. Shall we give cardiac stimulants in heart cases previous to operation? I do not know any one who could answer this question. This is not the place to discuss the preparation of the different types of handicap, nor, if it were the place, have I had sufficient experience with any one to speak with authority.

As far as I can deduce from my own experience and from the literature, the best pre-operative treatment to-day is general rather than special. It is the treatment that is harmless

to any one, beneficial to all, even if not required, and life-saving, undoubtedly, to a small proportion. This general treatment is rest, physical and mental, fresh air, restricted diet, moderate catharsis, increased water, restriction or complete elimination of alcohol and tobacco. I am confident that in time we will add massage and baths. Undoubtedly it would be better if, during these days of pre-operative treatment, we could create such an atmosphere or environment that the patient would be amused and entertained. To increase the number of hours of sleep and to make the waking hours enjoyable, is an environment in which the exhausted nerve cell has the best opportunity for rest and restoration of its energy.

Apparently specific treatment, except such things as quinine for malaria and salvarsan for syphilis, we have none. I might discuss diabetes, but the most recent medical literature concludes that there is no specific treatment, and each case must be considered by itself and the sugar tolerance found by experimenting with different foods.

The Treatment during the Period of Operation.—In the beginning of surgery, before anæsthesia, surgeons thought of practically but two things, time and hemorrhage. That is, to get the operation finished as quickly as possible and with the loss of as little blood as possible. After Lister's antiseptic methods, the surgeon became responsible for infection of the wound, and attention was turned chiefly to technic which would eliminate all sources of danger of infection. Not much attention was given to anæsthesia in those days. Chloroform was the anæsthetic of choice. Then ether gradually replaced chloroform, because it was safer. That ether has its dangers is indicated by the introduction of local methods of anæsthesia, intraspinal and intravenous anæsthesia. Surgeons, having perfected the technic of controlling hemorrhage, of preventing infection, and the various technical details of operative measures, have at last turned their attention to anæsthesia. Chloroform is given less, ether is given better. The trained, experienced anæsthetist has come, and now we

are investigating whether nitrous oxide and oxygen should not be the routine method of anæsthesia in all cases. Crile has added to this the local infiltration of the operative field, as the surgeon proceeds, with novocaine (1:400). This is by no means new. The combination of local and general anæsthesia is as old as local anæsthesia. But Crile at the psychological moment emphasizes its importance. The object of the local anæsthesia is to block as many nerve impulses as possible from the field of operation. There is no doubt that operative shock is caused by such impulses. General anæsthesia may protect the individual in his unconscious state from feeling them, may obliterate his memory centres, but the general anæsthesia does not entirely protect the nerve-cells from these afferent impulses. Chloroform and ether act injuriously directly upon the nerve-cell. There is no doubt about this. It looks very much as if the days of ether and chloroform were numbered. Apparently nitrous oxide, as far as our methods of estimating go, is harmless to the nerve-cell. It leaves no toxic substance in the body to be eliminated, it increases little if at all tissue waste. This anæsthesia, therefore, does not of itself produce fatigue or exhaustion of the nerve-cell or any other cell. It is therefore the anæsthetic of choice. Crile is of the opinion that the toxic action of novocaine, which is very slight, has far less deleterious effects than the afferent nerve impulses which it inhibits.

I employ nitrous oxide and oxygen as a routine in St. Agnes Hospital. Dr. Halsted introduced it and employs it in his clinic at the Johns Hopkins Hospital. Crile uses it in all his cases in Cleveland. The literature is full of reports on this method. Surgeons, therefore, to be up with the times, must heed this warning and instruct their anæsthetists at once to familiarize themselves with this method. Nitrous-oxide-and-oxygen anæsthesia should never produce cyanosis. It cannot be looked upon as quiet anæsthesia, it makes the surgeon's work in some operations more difficult, but it is always best for the patient. The surgeon will have to accustom himself to this anæsthesia. In abdominal work the infiltration with

novocaine gives relaxation of the muscles, but for deep pelvic work or exploration around the common bile-ducts one will find it more difficult to keep the intestines back. Yet, as experience grows, dangers and difficulties which at first seem real are found to be apparent only. The patient should always be given morphine and atropine half an hour before the administration of this gas. In some cases the morphine may be repeated in small doses. Not infrequently ether will have to be given a few drops at the time. One should expect anæsthesia from this gas in at least five minutes. If this does not occur, see if the gas is all right, if the apparatus or bags have no leaks. Excluding these possibilities, then there is the indication that the patient needs a little ether. But this is not a paper to discuss the best method of administration of this newer anæsthetic. The surgeon and his anæsthetist should have in mind that at the present time we should attempt to get along with as little ether as possible.

We have prepared the patient for the operation, and we have chosen the best anæsthetic and the most experienced anæsthetist. Shall the patient be anæsthetized in the room, or brought to the operating table prepared and then anæsthetized, or shall we employ any compromise between these two extremes?

One should choose the method which gives the patient the least fear and anxiety. I find that the majority of patients do just as well when they are brought to the operating table prepared and are then anæsthetized, but in some cases the gas should be given in the patient's room at an unexpected time. They may be prepared for this by Crile's method of stealing the thyroid gland. In regard to this point I feel that we are sure of only one thing, and that is the nitrous oxide and oxygen as an anæsthetic and the skilled anæsthetist. The other features may be unnecessary elaborations.

The prepared patient is now under nitrous-oxide anæsthesia. We can do little during the operation to increase his factors of safety. All the surgeon can do is to attempt to keep well within safe limits. With the ordinary healthy in-

dividual and the ordinary operation it is easy sailing. One perhaps need not look often at the barometer or compass. But with the handicapped patient and the extraordinary operation the surgeon is in a dangerous position. He needs all his art, all his acute senses of observation, and instruments of precision to help him, to warn him when to stop if he cannot finish. Operations in two or more stages are more frequent to-day than ever before. It is due to the fact that surgeons feel that they should be able to tell when to stop, so that every patient will recover from the operation. During the last year I have paid considerable attention to routine blood-pressure records, and at the present time I am getting the impression that the blood-pressure will warn the surgeon of the danger-line before the pulse or the respiration. My respect for the blood-pressure record is increasing daily, and I would urge all surgeons to use it in extraordinary operations and handicapped patients. But to learn to interpret these records, one must employ them at all operations as a routine. What can we do during the operation, outside of prevention, to increase the factors of safety? We can give salt solution per rectum, subcutaneously, and intravenously, or blood transfusion, and I know of nothing else. I believe all stimulants are contra-indicated. I am uncertain as to the value of coffee in a hot rectal enema. I often employ it. When the blood-pressure falls to 100 or lower, it is time to stop the operation and time to give the saline, which in such instances should be given immediately. I have had a few such cases with very happy results.

There is one point I wish to make clear which many surgeons do not seem to be familiar with. The patient seems in fair condition at the end of the operation, but no blood-pressure record is taken. He is lifted to the stretcher, carried to his room, and when put to bed is found to be in collapse requiring hurried treatment. This can be avoided in most cases if, after the operation is finished and the bandage adjusted, a blood-pressure record is taken. If this record is much lower than that taken at the end of the operation, it is an indication

that the patient should not be transported but kept quietly on the table and given the salt solution by one or all three methods. It is important, therefore, carefully to investigate the patient before he is lifted from the operating table to be transported, and to begin this post-operative saline treatment then if indicated. I am confident that this will prevent many of the cases of collapse or sudden vasomotor shock which are observed after the patient reaches his bed.

The shock in a surgical operation is first psychic. This does not begin the morning of operation, but undoubtedly acts from the moment when operation is suggested. The effects of such psychic impulses vary tremendously with different individuals. In some cases this psychic shock may be so intense that every method should be employed to avoid it. The possibility of an operation should be kept, if possible, from the patient. The patient may be sent to the hospital with the understanding that it is for diagnostic purposes only, and the operation can be suggested at the last moment. It is not necessary to discuss here the various methods and schemes which may be employed to reduce psychic shock. If the patient has absolute confidence in the surgeon, in the family physician who referred him to the surgeon, and in the nurse, and the hospital is one of his own choice, he has created for himself the best conditions to allay fear and psychic shock. There is no substitute for such confidence, and the surgeon is handicapped from the beginning if he has not the confidence of these patients.

In our attempt to bring the patient to the operation without his knowledge until the last moment, we may defeat our own aims and create in the patient's mind an exaggerated idea of the gravity of the operation. As a rule in my own experience, if I have the confidence of the patient I do not hesitate to speak in a natural way of the operation as an incident of treatment, and try by describing to him the newer and more modern methods to demonstrate that the operation is not an ordeal, and thus allay his fears. Nevertheless, in some cases all methods fail. Perhaps in this group the preliminary of

scopolamine and morphine will find its field of usefulness. One should hesitate to operate on an hysterical adult or frightened child, if the operation can be postponed with the hope that at the next attempt fear can at least be reduced. I have found that a patient, adult or child, who is nervous or hysterical before gas is administered, does not take the anæsthetic so well, and on a number of occasions I have postponed the operation.

We have by no means reached a satisfactory position in our prevention of psychic shock. There is ample opportunity for investigation in this line. Undoubtedly the more the good results of surgery are known to the public at large, the more will the prevailing fear of operation be diminished.

The surgeon must be familiar with the manipulations which produce shock. Nothing helps him more to estimate this than the blood-pressure. It is to be remembered that anything that either diminishes or increases the blood-pressure is a stimulation which sooner or later will lead to exhaustion and a fall of the blood-pressure. It is the uniform rate of pulse and respiration and the uniform blood-pressure that indicate an operation with the least degree of shock. During the entire resection of the colon with the anastomosis, if done without tension on the mesentery, one will observe very little change in the pulse, respiration, or blood-pressure, but the moment one pushes the intestines away, to suture the rent in the posterior peritoneum caused by the removal of the colon, the quiet patient moves, the pulse and respiration are more rapid, the blood-pressure rises at once, and if the patient's factors of safety are small, the blood-pressure quickly falls and the patient is in shock. The previous manipulations may have taken an hour or more, and these manipulations but twenty to thirty minutes. Now, it is such manipulations that the surgeon must avoid if possible. Better a long operation without these manipulations than a short one with them.

The question as to who shall be the anæsthetist must be decided in each clinic. I prefer a member of the surgical staff. I look upon anæsthetization as a stepping stone to

operative surgery. It is only a medical graduate who can really understand the problems in physiology which are to be investigated and solved in expert anæsthetization. The surgeon can work better with a trained medical mind giving anæsthesia than with any one else. It is also my rule that the chief anæsthetist ranks next to the resident surgeon, and anæsthetization is the duty of the senior and not the junior member of the staff. But, of course, this question is by no means settled.

Post-operative Treatment.—In the post-operative treatment we must consider the position of the patient; how water shall be given continuously for the next few days; how rest and sleep shall be induced, that is, how much morphine; what shall be given by mouth.

The immediate post-operative shock, if any, should have been treated in the operating room, as I have most emphatically stated.

When the patient reaches the ward or room, it has been my rule to start salt solution per rectum by the continuous method of Murphy in all cases, until the patient is able to take enough fluid by mouth to maintain kidney function. In my experience the amount of urine voided in the first 24 hours should be 1000 cubic centimetres or more, and proctoclysis should be maintained until this is accomplished. The giving of continuous salt solution per rectum by the method of Murphy is distinctly a problem for the trained nurse. It is her duty to become efficient with this method. When for any reason this method fails, the salt solution can be given subcutaneously at intervals of 4, 12 and 24 hours, alternately in the axilla and beneath the pectoral muscle.

Water and the white of egg can be given in most cases at once after operation, by mouth.

In most cases the position of the patient can be that in which he is most comfortable. Apparently for old people and for cases in which peritonitis is present or threatened, the Fowler position (sitting up) seems best. But this can be overdone. What one should seek is a comfortable position,

and to encourage, even command, change of the position by the nurse or the patient himself.

Morphine is not contraindicated in small doses for the first few days after operation.

This should be a routine for all patients. If this is followed, apparently the post-operative complications are less frequent and, when they do arise, the patient is in a better position to withstand them.

Post-operative Complications.—The first to be considered is disturbance of kidney function. This is often foretold by the test previous to operation and one after operation. When there is anuria with or without albumin and casts, we can push the salt solution a little more energetically, in some cases intravenously. We can give spartein and diuretin, the latter in cardiac cases. If there is no contraindication, elimination should be encouraged by the alimentary tract through catharsis, and through the skin by heat. One should be careful not to make these measures too energetic. One also should not over-stimulate renal function.

Dilatation of the stomach should always be looked for. Vomiting of a dark-brown duodenal fluid is an indication for lavage. Epigastric distress and distention should lead the surgeon to wash out the stomach, even if the vomiting is absent and the characteristic rapid pulse and depression of acute dilatation have not shown themselves. The washing out of the stomach for this complication is almost specific. After emptying the stomach of its contents and washing until the fluid is clear, it is my plan to leave in the stomach at least an ounce of castor oil. As a rule this lavage should be repeated at any interval if there are any recurrent symptoms, and in at least twelve hours if there are no symptoms, and this lavage should continue until one finds no duodenal contents in the stomach or no gastric residuum. If this rule is followed, the grave condition secondary to acute dilatation of the stomach will rarely if ever be seen.

Abdominal distention is the most frequent of the uncomfortable post-operative complications. Rarely is it absent to a

slight degree. Since the introduction of the continuous salt solution per rectum, all surgeons have noticed that this distention is less frequent and of shorter duration. Patients narcotized with nitrous oxide and oxygen also are to a certain extent relieved. The pre-operative treatment by starvation and no cathartic for 48 hours before operation is another preventive. Nevertheless, we still meet this complication. The best treatment is the rectal tube with enema combined with eserine hypodermatically. The enema should be oil and glycerin to which epsom salts and turpentine may be added, and there are other combinations. But my observation teaches me that one should begin in from 12 to 24 hours after operation with enemas at intervals, combined if necessary with eserine, until the gas is expelled. The indications for these enemas are the characteristic gas pains and abdominal distention. The differential diagnosis between this and obstruction must always be borne in mind. In such cases eserine would give no relief and the washing out of the stomach would relieve the distention only temporarily. But this is not the place to discuss the differential diagnosis.

Now and then morphine given hypodermatically relieves the gas pain and a little later gas is passed. I do not think it is contraindicated in small doses. It should be given when the eserine and the enemas do not give speedy relief. It is a clinical observation of mine for which I have no experimental proof.

Post-operative acidosis must be borne in mind. This is one of the dangers of a long pre-operative starvation treatment, and this treatment should always be checked by examinations of the urine, and the appearance of acetone and diacetic acid should be an indication for food and perhaps, in some cases, for postponing the operation. Post-operative acidosis first shows itself in the urine, next in the breath by its odor, and, last, in coma. One should never wait for coma to institute treatment. In the salt solution which is being given per rectum, bicarbonate of soda and glucose should be added in all cases of acidosis. Food by mouth should be increased. In

more critical cases the stomach tube should be passed, the stomach washed out, and a fair quantity of milk, sugar, and bicarbonate of soda left in the stomach. When coma supervenes the prognosis is very bad. Bicarbonate of soda should then be given in the salt solution intravenously. This subject of acidosis, pre- and post-operative, is coming to the attention of surgeons more frequently in the last few years. We observe it in gastric stenosis from ulcer or cancer when relief has been delayed; in chronic gastromesenteric ileus, and other forms of ptosis in which starvation is imminent on account of the inability to take food.

For impaired kidney function, dilatation of the stomach, intestinal distention from gas, and acidosis, we have fairly certain preventive measures and active measures of treatment. However, over the other post-operative complications we have less control.

The various types of cardiac failure, such as disturbance of compensation in a handicapped heart by the shock of the operation, the tachycardia of Graves's disease, and other types of tachycardia, toxic, psychic, and traumatic; for these we have no specific medication. It is fortunate if the cause was only the operative intervention, because this ceases with the operation, and as a rule in such cases the heart recovers its compensation in time. One, of course, should look to see if a factor is still active and remove it if found. Morphine is helpful in such cases, ice to the heart, and a comfortable position. This position varies. In fat people the heart seems to act better when they sit up, in thin people the reverse may be true. As a rule the head-low position is not the best for cardiac complications, except for the immediate post-operative cardiac and vasomotor shock. There is no specific treatment for post-operative pneumonia. All post-operative patients should be given plenty of fresh air and water, and this is best for pneumonia.

We apparently can do nothing for phlebitis. I have found that thick rolls of gauze wrung out in hot salt solution and

then employed as bandages from ankle to thigh give relief and reduce swelling.

The other complications I will not discuss here.

Post-operative Neurosis and Convalescence.—To a certain extent this is a preventable complication. In the first place the disease for which the operation was instituted may have been the etiological factor of the neurosis and, although the operation may have completely cured the local disease, the neurosis continues as a mental condition which, as we know, has to a certain extent a time limit before recovery takes place. Often before operation the symptoms of the local disease may be such that the neurosis is overlooked. After operation, the symptoms of the local disease having been removed, those of the mental condition come into view. I am confident that many of the so-called post-operative neuroses or neurasthenias are not post-operative at all.

There is every reason to believe that an operation can produce in certain individuals the disease that we call neurosis, neurasthenia, or melancholia. The pre-operative fear and fright, a toxic anæsthetic, the trauma of an operation, the post-operative complications and discomforts are by no means good for anybody, and may be very serious for the individual with an exhausted nervous system.

If all the details of the pre-operative treatment, of the operative anæsthesia and manipulations, and of the post-operative care are carried out, I am confident that everything has been done to reduce the factor of the operation as the cause of a nervous breakdown or the continuation of this nervous condition, present before operation.

This brings up the last point of this article: That post-operative treatment does not end with the discharge from the hospital in many cases. The patient should be under the care of his family physician, and, as most surgeons have had considerable experience with this condition, they can be helpful to the family physician with suggestions.

The operating surgeon cannot accomplish the best results

alone. There are needed in every community physicians who are capable of making diagnoses earlier, so that surgical disease, both acute and chronic, will be brought for surgical relief at a time when the operative mortality is least and the probability of a permanent cure best. These physicians should interest themselves with the surgeon and do their part in the pre-operative diagnostic measures and methods of treatment. They should be present at the operation, to add to the confidence of the patient; they should see the patient after operation. The physician should take entire charge of the patient after the danger of the surgical post-operative complications is over.

In the pre-operative diagnosis the surgeon must have the assistance of a clinician equally trained in his line to look at the medical aspects of the case. Both the physician and the surgeon require a corps of assistants to make the various laboratory examinations or inspections with instruments of precision. There must, therefore, be team work and, to a certain extent, an all-star team to give the operative patient the best chances of recovery.

But there is something in surgery beside recovery from operation. We wish the patient to be permanently relieved. The danger as a rule of an operation which insures permanent relief is no greater than the one which can be called incomplete.

No surgeon can afford to continue his operative work without constantly checking his ultimate results. He must know from year to year what patients he has and what he has not permanently relieved, and he must investigate the group in which the relief has not been permanent, in order to improve his results.

THE WIRING OF OTHERWISE INOPERABLE ANEURISMS.*

WITH REPORT OF CASES.

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THE operation of wiring otherwise inoperable aneurisms, devised in 1864 by Moore, of London, and subsequently modified by Corradi, is one which deserves more general attention and wider use than has up to the present time been accorded it by the medical profession. In fact, outside of this country, it has attracted little attention. Here, owing to the excellent work of Stewart, Hunner, and others, it has been employed in a number of clinics with a measure of success, that, considering the otherwise hopeless nature of the affection, has been fairly gratifying. The technic of the operation worked out by the authors above mentioned has been little modified by later observers. The modifications that have been suggested have been of minor importance. Some question as to the correctness of the conclusions of Stewart and Hunner has been raised by Freeman and others, but experience with a considerable number of patients, 23 in all, in which this operation has been employed, convinces me as to the soundness in the main of their deductions. Those interested in this subject should consult the monographs of Ransohoff, who in 1886 reported the first wiring operation done in this country, Stewart, Hunner, Matas, Freeman, Hare, and the most recent communication upon this subject, that of Eshner, in which he has collected and tabulated 38 reported cases up to May, 1910. To this number, my associate, Dr. B. M. Bernheim, without claiming an exhaustive review of the literature, has added 21 cases, including 18 of my own, hitherto unreported.

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For the benefit of those who may not be familiar with this procedure, it will not be out of place, perhaps, to call attention to a few of the most important points to be borne in mind: in the first place, in the choice of this operation, and in the second place, in its practical application. It goes without saying that cases in which this method is to be used should be selected with great care. It is equally obvious for anatomical and other reasons that methods of treatment applicable to aneurism in other parts of the body do not apply here. The brilliant and epoch-making work of the President of this Society (Matas) in the plastic surgery of the vascular system, the metallic bands of Halsted, and the suture methods of Carrel are in the present state of development of intrathoracic surgery clearly out of place in this region, although much is to be hoped for in the future. The same is true of the older methods, with the possible exception of the needling operation of MacEwen which has never been in general use. Palliation to a slight degree only can be reasonably expected from medical measures. Authentic cases of spontaneous cure are so rare as to warrant no reasonable hope of relief from this source. Wiring, then, is the only effective means at our disposal with which to combat this otherwise hopeless condition, for the tendency in aneurism of the aorta, in the vast majority of cases, is steadily progressive toward a fatal termination. Reason suggests and experience has shown that the only class of case in which this method offers any reasonable expectation of cure is in aneurism of the sacculated variety, especially when of traumatic origin. It is not applicable to and should not be employed in the fusiform variety. The reason for this is obvious.

The morbid condition of the vessel wall which gives rise to the weakening and subsequent dilatation of the arterial coats is as a rule not a localized process, and the usually accompanying increase in blood-pressure is opposed to the establishment of conditions favorable to a cure. An accurate diagnosis is essential in the selection of the individual case in which this method is to be applied. To this end, the X-ray,

especially the use of the fluoroscope, is indispensable, as the pulsation of the aneurism is readily distinguishable by the aid of this instrument.

The immediate risks of the operation, especially in aneurism of the thoracic aorta, are not great. They consist in the possibility of an end or loop of the wire sliding along the wall of the aorta in the direction of the heart and interfering with the action of its valves (its presence in the aorta gives rise to no symptoms), or in the formation of emboli which have been swept off by the blood current. That a loop of wire may even enter the cavity of the heart without fatal result is illustrated by Pasham's case where such a condition was found present at autopsy. That there is a real risk from emboli is well illustrated by a case reported to me by a physician who himself had been the subject of a thoracic aneurism which had incapacitated him from performing his professional duties. I had wired his aneurism with the result that he had resumed his practice in a distant city, and had himself subsequently wired a thoracic aneurism for a patient. In a letter to me, he writes that immediately after wiring the aneurism, the patient complained of pain and numbness in his arm, which at once became blue and went on to the formation of gangrene of the hand and forearm. He was compelled subsequently to amputate the arm above the elbow. The aneurism at the time his letter was written was apparently cured and the patient well satisfied, saying that he had rather have one arm and no aneurism than two arms with an aneurism.

The remote risks arise from emboli or sloughing due to a too strong electric current, sepsis, and from giving way of the aneurismal wall owing to the possibility of the new-formed clot shunting the blood current against another portion of the aneurismal sac. This last possibility has been denied by Freeman, but after wiring, I have seen upon more than one occasion a sudden bulging of the aneurismal sac in some one direction, which could not be accounted for in any other way than by a giving way of the aneurismal wall at that particular point.

While these risks are not great, indeed surprisingly small considering the nature of the affection and the structures with which one is dealing, yet it is only fair that their existence should be explained to the patient or his friends.

The immediate results attending this operation are sometimes most striking. Perhaps the most remarkable of all is the diminution in pain which takes place frequently before the operation has been completed. In a number of instances, the patient while yet upon the operating table has stated that the pain has appreciably decreased. This fact has been so frequently noted that I have felt justified in stating to the patient that even if he derives no other benefit from the operation, he can confidently expect a marked relief from his pain. What is true of pain is also frequently true with regard to dyspnœa which sometimes is very pronounced in advanced cases. The explanation of these phenomena is not altogether clear. One would rather expect that the disturbance caused by the operation itself and the presence of the needle and wire in the interior of the aneurismal sac might produce certain circulatory disturbances which would tend to increase rather than diminish the pain. It is possible that the electric current may exercise an anæsthetic effect. If the relief was due entirely to this fact, however, one would expect the pain to return after the withdrawal of the electric current, but such is not the case. As a rule, the hardening of the clot as shown by the lessening or disappearance of expansile pulsation does not take place for some days or even weeks, but immediate marked diminution in the pulsation of the tumor has been observed in a number of cases. This is not so surprising as the other phenomena to which we have just referred.

As to the technic of the operation, all that is necessary is a hollow needle, of not too large size, insulated with the best quality of French lacquer to within a short distance of its point. Through this, a suitable wire is passed. Various metals have been recommended for the wire. Hunner in his experiments found that a wire made from a silver and copper alloy in the proportion of 75 parts copper to 1000 silver

answered the purpose very well. We have used this in all our cases. The wire is wound tightly upon a wooden spool in order to give it a coil. Care should be taken to avoid kinking, as this interferes with its passage through the needle. After the skin has been cocainized and drawn to one side, the needle is inserted slowly until the arterial blood appears in jets through the needle. The end of the wire which has previously been passed into the lumen of the needle, but not as far as the point, is now passed into the aneurism until the amount wound upon the spool has been inserted into the aneurismal cavity. We have arbitrarily used ten feet. The objection that has been urged against a greater amount is that it prevents the contraction of the resulting clot in the course of its subsequent organization. Freeman and some others believe that the greater the amount of wire introduced into the sac the better. My observations have not borne this out. If the needle is not well insulated, or if it is pushed so far into the aneurismal sac that its shoulder comes in contact with the skin, there is danger that an electrolytic burn may result along the needle's track. The resulting slough decreases the strength of the aneurismal wall, and is liable to cause leaking at this point. Hare calls particular attention to this, and I have observed it in two of my own cases. Care should be taken that the strength of the electric current should not be too great, that is, it should not exceed 75 ma. Charring of the sac was observed in Halsted's case. Here the current was supposedly not greater than 75 ma. Subsequent hemorrhage resulted from necrosis of the sac at the point of charring. The current should be continued for at least one hour. In my later cases, I have continued it for nearly two hours. The positive pole should be attached to the wire, the negative at the patient's back. Disorganization rather than formation of clot occurs at the negative pole. After the current has been passed through the aneurism for the given time, the needle should be carefully withdrawn, making use of a slight rotary motion in order best to accomplish this. The wire should be cut as short as possible, depressing the skin by the point of

the blunt scissors. The skin should be then pinched up with the fingers, until the end of the wire is completely buried beneath the entire thickness of the skin. If the skin has been drawn to one side before the insertion of the needle as suggested, the end of the wire will not remain opposite the skin puncture. This seems a small point but it is necessary in order to prevent a certain amount of irritation, and the possibility of infection extending down along the course of the wire. Pressure should be applied immediately upon the withdrawal of the needle, in order to prevent the formation of a hæmatoma due to the escape of blood into the subcutaneous tissues through the needle hole. In one of my cases, an hæmatoma formed which gave rise to a sloughing of the overlying skin and subsequent infection of the clot, and undoubtedly hastened the patient's death from hemorrhage.

The ultimate results of this operation are necessarily somewhat disappointing when one considers the small percentage of cures. Some observers insist that no cases are permanently cured. This, however, it seems to me, is too extreme a statement. A small percentage of cases have died as the immediate result of the operation. A larger percentage have died from remote results of the operation. The vast majority have been improved by it. Improvement has lasted from a few days to a term of years. A few cases, I believe, can truthfully be said to have been completely cured. A good deal, of course, depends upon what constitutes a cure.

One of my own cases, an elderly physician from the South, who suffered from an aneurism of the aorta just above the bifurcation, is a case in point. His aneurism had previously been treated by Dr. Halsted by the application of one of his bands. Unfortunately, owing to some unexplained cause, a slight infection had taken place about the band. His symptoms continuing, at Dr. Halsted's suggestion I wired the aneurism through an abdominal incision. As a result, the patient's symptoms completely disappeared as far as his aneurism was concerned, but owing to the infection about the band and to his advanced age and weakened condition, he ultimately succumbed.

Autopsy showed a complete obliteration of the aneurismal sac and the cause of death to be due to infection. Comment is unnecessary.

In several of the cases, gelatin injections were administered in addition to the wiring, with apparently good effect. In a case reported in a private communication by Jones, this was done. The patient after six years is still living and in good physical condition, but has recently noticed a recurrence of pain in the chest.

It is of the utmost importance, and I want to emphasize this fact, that these cases should be kept as nearly as possible in a state of physiological rest for a term of months after the wiring. In this way only will the best results be secured. In three of my cases, after the complete subsidence of all symptoms referable to the aneurism, the patients because of this fact, and in spite of orders to the contrary, dated the return of their trouble immediately following some unusual effort. Hirschfelder suggests that the administration of the calcium salts, after the method of Wright, both before and after this operation might be of advantage. So far as I know, this has never been done. It is worth a trial.

Of our 23 cases, so far as I know, but we have not been able to trace them all, only two are still living—one after nearly three years, the other not quite a year. Both were aneurisms of the thoracic aorta. All my cases were males, mostly young men, only two being over fifty years of age. One-half of them gave a history of lues and one who denied it had a positive Wassermann reaction. Over 25 per cent. admitted using alcohol to excess. In three instances, the trouble was of traumatic origin. In one case, the recurrence dated from a fall from a height, the patient catching himself with the hand of the affected side. This case was of special interest because I resected the greater part of the first and second portions of the sternum and the first, second, and third ribs on one side in order to expose and examine the aneurismal sac, so close was it to the heart, before daring to insert the wire.

It is an interesting fact that at first practically all of our cases were aneurisms of the abdominal aorta. In recent years, the reverse has been true and they are now almost all of the thoracic variety. The latter are more amenable to treatment by this method, owing to their greater accessibility and because a general anæsthetic is not necessary.

On the whole, the results of this operation, when one considers the absolutely hopeless condition of the patient under any other method of treatment, would seem to justify its employment in every case where it is not otherwise contra-indicated.

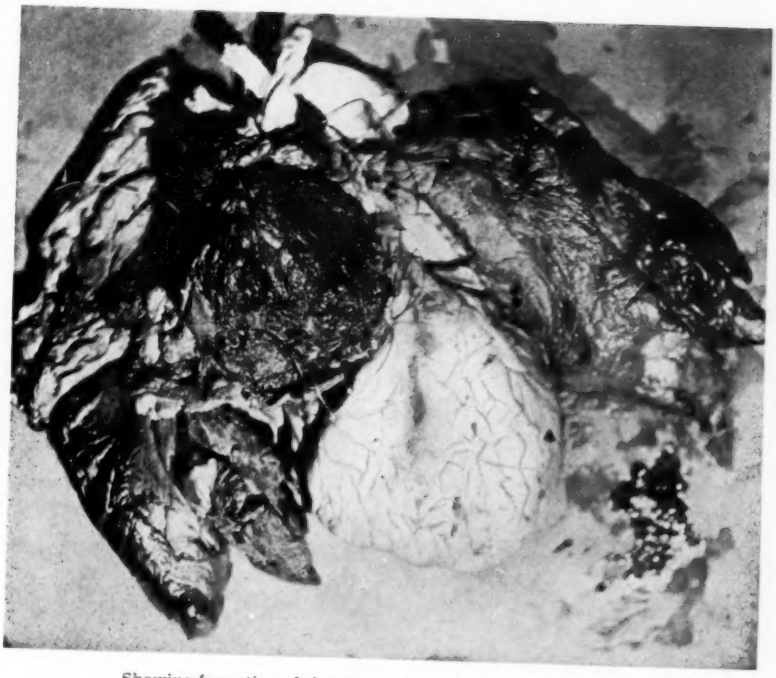
CASE I.—No. 740. W. T. G., male, aged twenty-seven years. Printer. Diagnosis, abdominal aneurism.

Patient entered the hospital complaining of swelling, pulsation, and pain in the abdomen. He gave a suspicious syphilitic history. He had had pain and soreness in his stomach and intestines for four or five years, but the symptoms had gotten much worse during the six months previous to admission. Pain was so severe that he was unable to lie on his back or right side, and when he walked, he had to walk with a decided stoop. Upon examination, a pulsating mass was found in the epigastrium about the size of a fist. A distinct thrill could be felt and heard over this mass. At operation by Dr. Halsted, seven inches of No. 5 silver wire were inserted into the aneurism, when it kinked. The current was run through this twelve minutes, after which the wire was cut off. At another point 38 inches of No. 4 wire were inserted and the galvanic current run through this wire for 1 hour and 25 minutes, varying from 30 to 100 ma. No change in the pulsation of the tumor was noted. The patient died 24 hours after operation from rupture of the aneurism through the diaphragm, probably due to a burn from too strong electric current.

CASE II.—No. 8050. R. E. E., male, aged twenty-five years. Bookkeeper. Diagnosis, aneurism of the superior mesenteric artery.

Patient entered the hospital complaining of pain in the abdomen. He had a suspicious syphilitic history. For about one year previous to admission he had been suffering increasing

FIG. 1.



Showing formation of clot about wire coiled in aneurismal sac.

pain of a sharp and steady character in his abdomen, so much so that he was unable to work. On examination there was found a pulsating globular mass in the epigastrium, a little to the left of the middle line, the pulsation was of an expansile character, and there was a distinct thrill. At operation August 27, 1908, the pancreas was found covering the sac and had to be dissected off of it, after which five feet of drawn silver and copper alloy wire were inserted without difficulty. The galvanic current was run through this wire for 1 hour and 20 minutes, strength varying from 30 to 70 ma. The pulsation in the tumor seemed less after the wiring and there was no thrill to be felt. Following the operation, however, the patient continued to suffer great pain and finally died 20 days later from rupture of the sac into the duodenum.

CASE III.—No. 9935. M. P., male, aged thirty years. Machine agent. Diagnosis, abdominal aneurism.

The patient entered the hospital complaining of an aneurism. He denied syphilitic infection. For about one year previous to his admission, he had been suffering intense pain in his abdomen, radiating to his back. This pain gradually became so bad that he was unable to walk 50 yards, and he had to take a great deal of morphia to get relief. Upon examination, there was a definite bulging in the epigastrium, where a distinct tumor having an expansile pulsation could be felt. A systolic and diastolic bruit could be heard over it. On January 26, 1900, nine feet of silver and copper alloy wire were introduced into the aneurismal sac and 10 ma. of current sent into it for one hour.

The patient was discharged about two months later, having obtained great relief from his pain. Otherwise, however, there was no benefit. The tumor and pulsation could still be felt.

CASE IV.—No. 10,379. H. C. P., male, aged thirty-six years. A lawyer. Diagnosis, abdominal aneurism.

Patient entered the hospital complaining of pain in the stomach, inability to sleep, and loss of appetite. He denied a luetic history. He was a rather heavy drinker. For about a year patient had been suffering from pain in the abdomen, especially on lying down. This pain gradually became so terrific that the patient was unable to sleep or eat. He was accustomed to take great quantities of laudanum. The pulsation was of an expansile character, and a systolic murmur could be heard over

the tumor. At operation 11 feet of wire were introduced into the aneurismal sac and 10 ma. of current were run through for one hour. The patient reacted well to operation, but four days later he began to have great pain and difficulty in swallowing and his pulse rose to 130. He continued in this condition for four days, when he suddenly died. No autopsy.

CASE V.—No. 11,080. R. W. F., male, aged fifty-three years. Machinist; married. Diagnosis, aneurism of the abdominal aorta.

The patient entered the hospital complaining of a full feeling in the abdomen. He had a suspicious syphilitic history. Had lost 70 pounds in three years. For six months he had suffered from palpitation, shortness of breath, and pulsation in the abdomen. He had had no pain, his appetite was good, no cough or no epigastric symptoms. Upon examination, a prominent pulsating mass was found in the epigastric region a little to the left of the median line. Pulsation was of an expansile character. No definite thrill was felt, but a systolic and diastolic thrill was clearly heard. At operation, 11 feet of silver-copper alloy wire were introduced and 10 ma. of current were run through the wire for one hour. The patient was not improved by the operation. He was discharged later at his own request.

CASE VI.—No. 11,189. J. D., male, aged thirty-four years. Carpenter. Diagnosis, abdominal aneurism.

Patient entered the hospital complaining of an abdominal aneurism. He had had a syphilitic infection. For two years the patient had suffered from pain in his back and for three months pain in his abdomen. Of late the pain had been so bad that he was unable to work and was compelled to take morphia for relief. He had himself noticed pulsation in the abdomen. Upon examination a wide area of pulsation was felt in the epigastrium a little to the left of the median line, and a systolic bruit heard. No definite tumor, however, could be made out. Ten feet of alloy wire were inserted and 10 ma. of current were run in for 1 hour and 15 minutes. Operation was performed November 16, 1900. Fifteen days later the patient suddenly began to have extreme pain in his back, accompanied by nausea and vomiting, and died.

CASE VII.—No. 14,053. A. B., male, aged forty-three years. Married; a pilot. Diagnosis, abdominal aneurism.

The patient entered the hospital complaining of pain in his abdomen. He had always been a heavy drinker. He denied syphilis. For five years he had had a sharp stinging pain about the umbilicus. Five weeks before admission this had become so bad that he had to stop work. Upon examination there was a pulsation which could be seen and felt all over the abdomen, but in the epigastrium a definite mass having an expansile pulsation could be felt. There was a systolic shock and thrill. At operation, November 14, 1902, 11 feet of wire were inserted and 10 ma. of current run through this wire for one hour. Patient complained of violent pains throughout the entire operation. Following operation, there was no improvement in the condition except possibly that the tumor could not be as readily grasped and the pulsation seemed less than before operation. He was discharged at his own request one month after operation somewhat improved.

Case VIII.—No. 21,248. A. T. Van H., male, aged forty-six years. Married; mechanical engineer. Diagnosis, thoracic aneurism.

The patient entered the hospital complaining of pain in his chest. He had had syphilis. He had been a moderate drinker but a very hard worker. For two years he had had sharp pain near the centre of his chest. He had also had an intermittent cough but no expectoration. The pain extended to his back and down the arms, and was so severe that he was unable to lie down on his left side. No shortness of breath and no difficulty in swallowing. Upon examination there was a distinct precordial bulging or heaving and a very definite pulsation, being especially marked at the fifth right interspace near the sternum, where a diastolic shock could be felt. There was no thrill. The patient had a definite tracheal tug. At operation, September 13, 1907, three-fourths of the sternum and the end of the right clavicle were resected together with the costal cartilages of the first four ribs on the right side. Eleven feet of wire were inserted into the aneurismal sac and 10 ma. of current run into it for 50 minutes. Three weeks after the operation the patient was discharged practically well. The area of the heaving and pulsation was considerably diminished, and the patient had practically no pain.

On June 29, 1908, patient was re-admitted. He had been at work ever since two weeks after his previous discharge. He

was all right until April 1, 1908, when he slipped while on a scaffolding, and to prevent himself from falling he grasped hold of a piece of timber with his left hand, injuring his chest severely. Soon after this he noticed a swelling over his chest. No dysphagia, no dyspnœa, and very little pain. Upon examination, to the right of the median line at the second interspace there was a small conical swelling which had an expansile pulsation, and over which a diastolic shock could be felt. Twelve feet of wire were inserted into the aneurismal sac and a current varying from 10 to 40 ma. was run through the wire for one hour.

One month later he was discharged in excellent condition, the tumor was smaller, no dyspnœa, and no dysphagia. He died some months later from rupture of the sac.

CASE IX.—No. 21,650. B. T. H., male, aged forty-three years. A customs inspector. Diagnosis, thoracic aneurism.

Patient entered the hospital complaining of an aneurism. He had had syphilis. For several years he had had a sharp pain under his right sternum. This pain radiated into his right shoulder and the right side of his neck, also under his right scapula. There was considerable difficulty in talking and swallowing but no dyspnœa. Upon examination a round prominence, 7 cm. in diameter, was found in the second right interspace. There was a definite expansile pulsation and systolic and diastolic murmur. December 6, 1907, 11 feet of wire were inserted into the aneurismal sac and a 10 ma. current was run in for one hour. The patient showed no marked improvement, and on March 7, 1908, the aneurism was wired again. Eleven feet of wire were inserted and 10–14 ma. run through for 20 minutes. Six weeks later the patient was discharged improved. The tumor still remained, but the pulsation was less. Systolic and diastolic thrill were still felt. There was no pain and the patient felt very well.

CASE X.—No. 22,027. H. L., male, aged thirty-nine years. Married; farmer. Diagnosis, thoracic aneurism.

Patient complained of pain in the right chest and right arm. He denied syphilis. About a year and a half previous to admission he was kicked in the chest by a mule, and suffered great pain here and in the right shoulder and arm ever since. Four months after the injury he noticed a pulsation in the right upper chest. This has become more marked, and there have been sharp pains in the chest and left scapula so that he has been unable to

walk. Upon examination there was a marked pulsation in the second right interspace, over which a systolic murmur could be heard and a heave could be seen and felt. There was no tracheal tug. Upon fluoroscopic examination by Dr. Baetjer a sacculated aneurism was made out. On March 3, 1908, 11 feet of wire were inserted into the aneurismal sac and for one hour a current varying from 10–20 ma. was run in. The patient improved after the operation but developed a left hydrothorax, for which he had to be tapped several times. He was discharged three months after operation in fairly good condition. There was, however, a marked systolic pulsation in the first and second right interspaces and a heaving impulse over the rest. There was no pain.

CASE XI.—No. 23,359. J. S., male, aged twenty-five years. Blacksmith. Diagnosis, thoracic aneurism.

Patient entered the hospital complaining of palpitation of the heart. He denied all venereal infection. About one year previous to admission, while lifting a heavy wagon, he was seized with a violent pain in his left shoulder which radiated down his left arm. This was accompanied by severe palpitation of the heart. Since that time the pain has continued and the patient has been troubled a great deal with palpitation, shortness of breath on exertion, a dry cough, and inability to sleep. Upon examination there was a bulging of the whole left chest, and on palpation of the second and third interspaces, a pulsation of a rather expansile character could be made out. Over this area there was great tenderness. A systolic and diastolic thrill could be felt. On December 18, 1909, 12 feet of wire were inserted into the sac, and for one hour the current varying from 10–40 ma. was run through the wire. The patient was discharged four months following the operation in good condition. The heave and pulsation could still be felt in the left chest, and the bulging was still present together with the systolic and diastolic murmur, but the pulsation was considerably diminished and the pain had entirely disappeared.

CASE XII.—No. 23,652. Dr. S. M. O., male, aged sixty-eight years. Diagnosis, abdominal aneurism.

The patient entered the hospital complaining of colic-like pain in the abdomen. He denied all venereal infection. He had been losing weight for several years, and of late had been suffering pain in the abdomen. This became so severe that morphia

was necessary to obtain relief. Six months previous to admission he noticed a mass in the epigastrium which was quite tender. He was a heavy drinker and smoker, and had lost 60 to 70 pounds. On February 23, 1909, Dr. Halsted put one of his aluminum bands on the aorta just above the renals. Following this there was for a time a decrease in the size of the tumor. Gradually, however, the aneurism began to increase in size and the pain became so terrific that wiring was advised. On March 12, 1909, therefore, 11 feet of wire were inserted into the aneurismal sac, and for one hour a current varying from 10–40 ma. was sent into the sac. The patient was not improved by the operation and gradually lost ground, until death ensued seven weeks after the first operation and four weeks after the second operation.

At autopsy an abscess was found in the right ileopsoas muscle, originating about the band. (There was a sacculated aneurism, inside of which around the wire there was a beautifully healed organized clot. The patient had died of an infection.)

Case XIII.—No. 25,784. J. B., male, aged forty-eight years. Married; laborer. Diagnosis, thoracic aneurism.

The patient entered the hospital complaining of tumor in the chest. He had had a suspicious syphilitic history. He was a rather heavy drinker. For four months previous to admission he suffered from pain in the right side of his head so that he could not work. His voice became hoarse, and he was troubled with a cough and bloody sputum. He occasionally had pain in the right chest, shortness of breath, and orthopnœa. Upon examination there was found a great bulging in the right upper chest, wide area of pulsation to the right of the sternum, pulsation being of an expansile character. There was a faint systolic thrill to be heard, no tracheal tug. May 6, 1910, 11 feet of wire were inserted into the aneurismal sac, and for one hour a current varying from 10–40 ma. was sent through the wire. Three weeks later the patient was discharged subjectively markedly improved, but the condition in the chest was about the same.

The patient died November 2, 1911. (Personal letter from his wife.)

Case XIV.—No. 25,816. H. L., male, aged thirty-six years. Married; laborer. Diagnosis, thoracic aneurism.

The patient entered the hospital complaining of pain in the

right side. Denied all venereal infection. For three and a half months he had had a cramp-like pain in the right chest, so much so that he was unable to work and unable to sleep. He had a slight cough. Upon examination there was a visible pulsation in the second right interspace, where a forcible heaving impulse and faint thrill could be felt. There was a diastolic and systolic murmur to be heard, and a definite tracheal tug was present. The Wassermann reaction was positive. On April 22, 1910, 12 feet of wire were inserted into the aneurismal sac, and for one hour a current varying from 10–40 ma. was run through the wire. The patient was discharged three weeks later much improved. No more pain, but the pulsation in the chest was about the same.

CASE XV.—No. 25,817. E. G., male, aged forty-eight years. Laborer. Diagnosis, thoracic aneurism.

The patient entered the hospital complaining of pain and swelling in the chest. He had had a syphilitic infection and was a hard drinker. For seven months previous to admission following the lifting of a heavy weight, the patient became suddenly very weak. Since then he has had dizzy spells and a dull pain in the upper right chest and arm, especially at night. For one month he had noticed a swelling in the right chest, which has been getting larger. His Wassermann reaction was positive. Upon examination there was a pronounced bulging tumor having an expansile pulsation about the size of a small lemon to be seen in the second and third right interspaces. There was a systolic and diastolic thrill. On April 22, 1910, 11 feet of wire were inserted into the aneurismal sac, and for one hour a current varying from 10–40 ma. was sent through the wire. For a time the tumor, pulsation, and pain had decreased, but just before discharge, four months after operation, the tumor began to increase in size and again the patient began to suffer pain and considerable dyspnœa.

CASE XVI.—No. 26,914. Dr. M. W., male, aged thirty-seven years. Single. Diagnosis, thoracic aneurism.

The patient entered the hospital complaining of an aneurism. He had had a syphilitic infection. He was a moderate user of alcohol and tobacco. For four years he had been a great sufferer from angina pectoris. In 1908 he noted a pulsation in the second left interspace, following which he had sharp pain in the left

chest, radiating down into his back and shoulder. Morphia was necessary to obtain relief. In 1910 a definite bulge in the region of the left third rib was noted; this increased slowly and the pain became a great deal worse. Upon examination there was a bulging swelling in the left upper chest between the first and third ribs, the pulsation being of an expansile character. There was a systolic and diastolic thrill. On November 18, 1910, 12 feet of wire were inserted into the aneurismal sac, and for one hour a current varying from 10–40 ma. was run through the aneurism. The patient was discharged four and a half months after operation greatly improved, both subjectively and objectively, and from a personal letter the patient said that he is now enjoying fairly good health (December, 1911).

CASE XVII.—Nos. 27,272 and 27,758. F. G. J., male, aged thirty-six years. Married; salesman. Diagnosis, thoracic aneurism.

The patient entered the hospital complaining of pain in the left chest and a tumor. He had a suspicious syphilitic history. He had always been a hard drinker. About two years previous to admission he began to have a dull ache in the left chest, worse at night. One year after this he noticed a change in his voice, he became easily exhausted and short of breath on exertion. A peculiar brassy cough developed shortly after this, with swelling in the left chest which also increased steadily in size. All his symptoms became gradually worse, especially the pain which radiated down to his left arm. Upon examination there was a heave to the whole upper chest to the left of the sternum. In the second interspace there was a definite pulsation and swelling, the pulsation being of an expansile character. There was a systolic and diastolic thrill to be made out. On January 29, 1911, 10 feet of wire were inserted into the aneurism, and for one hour a current varying from 10–40 ma. was run through the wire. One month later he was discharged in good condition. He had almost no pain. His voice was still husky, but the cough was relieved.

On May 4, 1911, the patient was re-admitted. He said that following his discharge he continued to improve until, one week previous to his second admission, after no unusual exertion, he noticed a dull pain in the left chest about the position of the old aneurism. Following this he noticed a prominence in this

area and a pulsation. There was no pain or discomfort. Upon examination there was a definite pulsating tumor in the third left interspace.

There was no pulsation in the back. A tracheal tug was present but not especially marked. On May 8, 1911, the aneurism was wired again. Ten feet of wire were inserted and the current run through from 10–40 ma. for one hour. Following this operation the pulsating tumor seemed to become solid and the pain disappeared. On June 4, 1911, however, after having been up and about for several days, the aneurism suddenly grew larger and caused great pain. Its diameter became 12 cm., whereas before this it was 5 cm. The skin over it was red and tender, and the patient's temperature was 102°. On June 6, the aneurism was wired again. The idea of this operation was to block pressure from below and to strengthen the anterior wall of the sac which had apparently given way. The needle was, therefore, passed into the aneurismal sac on a slant and the wire wound on a smaller spool than usual in order to get a smaller curve. As in the previous wiring, the needle apparently passed through a thick clot before the sac of the aneurism was entered, and after two feet of the wire had gone in with comparative ease it seemed to block and the operator felt that the wire probably twisted on itself, for after a little pressure a new start was given and another foot or two passed in easily. This performance was repeated several times until finally it was impossible to pass in any more wire, about nine feet having been inserted. The current was then run in as in the previous operation. The operation was done in the ward and the patient did not have to be lifted from his bed.

Four days later, June 10, 1911, the aneurism was very firm and there was only a slight pulsation. There was considerable pain, however. The temperature was normal. On June 20 there was no expansile pulsation, very little pain, and slight infection over the aneurism, however, broke through the skin.

On July 13 the patient was up in a chair and seemed in good condition generally. He was discharged on July 17, 1911, able to get about.

CASE XVIII.—No. 27,285. G. B., male, aged forty-four years. Laborer; single. Diagnosis, thoracic aneurism.

The patient entered the hospital complaining of pain in his

right chest. He denied all venereal infection. He had always been a hard worker, had used alcohol moderately. He had had pain in the upper right chest for two and a half months, worse at night, which was of a sharp and shooting character. It sometimes radiated down the arm, shoulder, and the neck. He had some dyspnœa. His symptoms had become worse just before admission. Upon examination there was a systolic heave to the manubrium and the right upper chest. There was a localized pulsation in the first right interspace where a systolic pulsation and thrill was felt together with a diastolic shock. There was a systolic and diastolic murmur over the heart. His Wassermann was negative. On February 6, 1911, 11 feet of wire were passed into the aneurismal sac and the galvanic current run in from 10–40 ma. for one hour. There was marked diminution in the pulsation, and the pain had almost disappeared on February 17. February 24 the patient was discharged in good condition.

CASE XIX.—Nos. 27,915 and 27,966. H. H. H., male, aged thirty-five years. Married; electrician. Diagnosis, thoracic aneurism.

The patient entered the hospital complaining of an aneurism. He had had a urethritis but denied syphilis, and there were no secondaries. His Wassermann was negative. He had been a steady drinker for three years, and had used a good deal of tobacco. He had had pain in the upper left chest for nine months. This pain later on went over to his right upper chest and down his right arm. He had suffered from shortness of breath and palpitation of the heart, but his chief complaint was the constant pain which necessitated great quantities of morphia. This pain radiated into his right arm, back, and shoulder. Upon examination there was a pulsating tumor in the right upper chest, most marked in the third right interspace. The pulsation had an expansile character, and a to and fro murmur could be heard over it. On fluoroscopic examination by Dr. Baetjer a pulsating mass could be seen behind the sternum rather high up. There was some bulging to the right. On June 14, 1911, 11 feet of wire were passed into the sac, and 20 ma. of current were sent into it for one hour. The patient was unable to stand more than 20 ma. On June 20 there was definitely less pulsation and no pain. On June 27 the patient was discharged much improved.

CASE XX.—No. 28,689. G. W., aged twenty-seven years. Laborer. Diagnosis, thoracic aneurism.

The patient entered the hospital complaining of shortness of breath. He had had syphilis in 1908, and had been a heavy drinker. For 19 months he had had pain in his chest. One month after the pain began he became hoarse, and five months after the pain began he became dyspnœic and had palpitation of the heart. The pain radiated to his shoulder and right arm. He had had a cough since the onset. All his symptoms gradually became worse. Upon examination there was a prominence of the second and third left costal cartilages. Near the sternum there was a definite pulsation to be seen. No shock but a soft diastolic blow could be heard over the area. The left arterial pulse was delayed. There was a definite tracheal tug. On November 3, 1911, 11 feet of wire were passed into the sac. No spurt of blood followed the introduction of the needle as is usual. It felt as if the wire were passing through a soft clot. After the introduction of a considerable amount of wiring, the usual sudden pulsating stream of blood appeared, and it was evident that the wire had entered the sac. A current of from 10–40 ma. was passed through the wire for one hour.

On November 9 he began to complain of great pain in his right breast. His abdominal muscles became rigid. This condition continued and a few days later grew considerably worse, so that great quantities of morphia were necessary to relieve him. He became dyspnœic. Nothing definite, however, could be made out upon examination. He finally died.

At autopsy the anatomical diagnosis was aneurism of the descending aorta, multiple aneurisms of the thoracic and abdominal aorta; complete thrombosis of the superior mesenteric aorta with collateral circulation established; aneurism of the right renal artery with a mural thrombosis; abscess in the subcutaneous tissue around the wire; aortic insufficiency and bronchopneumonia. Numerous strands of wire extended down throughout the thoracic and abdominal aorta to the orifice of the renal arteries. Thromboid masses were adherent to the wire throughout its course. A loosely adherent thrombus was found at the bifurcation of the iliac arteries. There were three definite aneurisms of the aorta—the one which was wired in the ascending aorta, another in the descending aorta, and a third just below the cœliac axis. The immediate cause of death in this case was probably bronchopneumonia.

CASE OF DOCTORS C. L. JONES AND C. S. HAMILTON, of Columbus, Ohio (personal communication).

L. R. T., aged 48 years, male. Diagnosis, thoracic aneurism. The patient entered the hospital complaining of pain in the chest and back. He denied all venereal infection. He had always been a hard drinker, has drunk a good deal of beer and wine. On June 16, 1905, he was thrown from a street car, and being picked up unconscious was carried to the hospital. Ever since that injury he has suffered great pain in his chest. It was not very severe at first, but later increased in severity and radiated from his right chest to the back between the shoulder-blades. He finally became so uncomfortable that he was unable to sleep in a recumbent position. He suffered greatly from shortness of breath and became dizzy on slight exertion. His voice became husky and he developed a dry cough. Upon examination a heaving impulse could be felt to the right of the sternum, most marked in the second interspace. No thrill could be felt. A tracheal tug was present. No murmurs could be heard over the site of the aneurism. Blood-pressure was 132. On February 24, 1905, 19 feet of silver alloy wire were passed into the aneurismal sac and the current was run in for one hour, varying in intensity up to 20 ma. Following the operation all pain ceased. Pulsation in the chest was distinctly less, and the shortness of breath gradually disappeared. The patient left the hospital 20 days after the operation in good condition and has remained so up to within about a month ago, when his old pain recurred. At present he is living in Denver and is considering being rewired.

CASE OF DR. JOSEPH R. EASTMAN (*N. Y. Med. Journal*, December 15, 1906).

The patient was a male, aged 41 years. Waiter. He denied all venereal history, but he was a heavy drinker of beer and whiskey and was a heavy smoker. About six months before admission to the hospital he noticed a pain in the left side above the cardiac region. This pain was sharp and shooting in character and so severe as to almost cause him to fall. It radiated through the shoulder to the posterior scapular region and became continually worse. He coughed only during the last week before admission. At times his voice was almost completely lost. Upon examination there was a large area of distinct heaving pulsation above the left nipple. There was an expansive pulsation in the fifth right interspace and a distinct bulging above the left nipple. There was an oval palpable tumor one and a half inches in diameter above the left nipple line upon the second and third ribs and second interspace. No bruit could be heard over the tumor. On February 13, 1906, 15 feet of No. 28 silver wire were inserted into the cavity of the aneurism. After the introduction of the wire the pain became worse, and three weeks later five feet of the wire were removed. Orthopnœa developed and gradually became worse. The left chest became filled with a serosanguineous fluid, which was drawn off one month after the operation.

The patient died suddenly on May 4, 1906, with a profuse hemorrhage at the mouth.

At autopsy there was found a large aneurism just above the heart, which through pressure had ruptured into the trachea. At the conclusion of this article, there is a note which reads, "Galvanism was not employed after the introduction of the wire for the reason that the dangerous condition of the patient forbade it."

CASE OF DOCTORS J. M. ANDERS AND J. P. MANN (*Transactions of the College of Physicians*, Philadelphia, 1908, volume xxx).

The patient was a colored man aged 36 years. He entered the hospital complaining of a painful throbbing lump in his chest. He had had syphilis, but claims the primary sore had appeared only four months previous to his admission. He had always been a heavy drinker. Four years previous to his admission he noticed a dull boring pain under the sternum. Soon a small painful throbbing protuberance appeared to the right of the midsternal region. He had at times suffered from a severe cough, marked dyspnœa, and general weakness. Four days prior to admission, during a "spree," he suddenly felt a sharp pain accompanied by a sense of something giving way in the chest. This was attended with a smothering sensation, and at the same time, he noticed that the tumor became rapidly larger. On examination, there was a conical tumor mass projecting from the thorax at the right edge of the sternum. It was about two and a half inches in height and three inches in diameter at the base. There was a definite expansile pulsation to be felt, and a systolic murmur to be heard over this tumor. On January 29, 10 yards of fine silver and copper wire were inserted into the aneurismal sac. Almost immediately the expansile pulsation was markedly diminished and the tumor mass was less prominent. About two weeks later an additional slight elevation above the second right rib was visible. This also gave an expansile pulsation and slowly increased in size, so that on February 13 several yards of fine silver wire were inserted into this. On February 28 the entire surface of the primary tumor mass sloughed off, exposing the wire coiled up within the aneurismal sac. Following this there was a slight oozing of blood occasionally to be seen, but the wound gradually healed by granulation. The patient gradually recovered his strength, and the tumor mass, which was wired, showed only very slight pulsation. On March 10, 1908, the patient was in good condition. (Apparently no current was used in this case at all.)

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A FURTHER CONSIDERATION OF AN OPERATION FOR POTT'S DISEASE OF THE SPINE.

WITH REPORT OF CASES FROM THE SERVICE OF THE NEW YORK ORTHOPÆDIC HOSPITAL.

BY RUSSELL A. HIBBS, M.D.,

OF NEW YORK.

On May 27, 1911, I published[1] a preliminary report of three cases of Pott's disease of the spine, which had been subjected to an operation for the purpose of producing a fusion of the posterior aspects of the vertebræ, to obliterate motion of the vertebral articulations over the diseased area and to relieve pressure on the involved bodies, thereby hastening the cure of the disease and preventing deformity.

In one case only had a sufficient length of time elapsed on the date of the above-quoted publication to make possible the demonstration of a fusion by X-ray picture. At the present writing an equally positive demonstration has been given by the same test in the other two cases previously reported.

Further, in all three instances the strength and functional sufficiency of the new and continuous bone splint covering the affected vertebral area has been abundantly demonstrated by the use to which it has been subjected. The three cases have been without external support long enough to justify the conviction, not only that fusion has taken place but that it has obliterated motion over the operative field, prevented any increase of deformity, and eliminated all symptoms of disease.

The operation was suggested to me by my experience in the use of an operation involving practically the same principles, for stiffening the knee-joint by mortising the patella into the joint after it was denuded of periosteum.[2] The patella periosteum was carefully preserved and sutured to the periosteum of the femur above and to that of the tibia below. In these

cases continuous bone was produced between the femur and the tibia, obliterating the joint.

I thought that in the spine the careful removal of the periosteum of the spinous processes and the laminæ, with the spinous processes transposed to bridge the gap between the vertebræ, would lead to formation of bone, fusing the vertebræ, and eliminating motion between them.

It is important to observe that in the case of the spine, the gap to be bridged between the laminæ and the spinous processes of any two adjacent vertebræ is very narrow. Fig. 1 is a photograph of a dried preparation of the vertebral column and ligaments showing the narrow gaps very plainly.

In performing the operation, a longitudinal incision is made directly over the spinous processes, through skin, supraspinous ligament, and periosteum, to the tips of the spinous processes. The periosteum is split over both the upper and lower borders of the spinous processes and the laminæ, and stripped from them to the base of the transverse processes.

Fig. 2 is a drawing made from a dissection which shows the periosteum retracted and the spinous processes transposed.

Fig. 3 is a lateral view of the transposed spinous processes.

The lateral walls of periosteum and of the split supraspinous ligament are brought together over these processes by interrupted chromic catgut sutures. The skin wound is closed by silk, and a steel brace applied with the space between the uprights increased somewhat at the site of the wound so as not to make pressure upon it.

Rest in bed is absolute for eight weeks. During the next four weeks sitting up is permitted. At the end of the twelfth week walking is allowed.

The brace is continued for another month, when it is removed for a part of each day until gradually left off entirely.

CASE I.—Edward Q., age nine years. Lumbar Pott's disease of three years' duration. Moderate kyphos. Almost complete destruction of bodies of the second and third lumbar vertebræ. Disease active.

Operation (January 9, 1911).—The operation included the last dorsal and three upper lumbar vertebræ, the spinous processes and the periosteum of the laminæ as far as the base of the transverse processes being used in establishing the line of new bone formation.

Fig. 4 is a photograph of the boy before operation. Fig. 5 shows him 15 months after operation, or 12 months after all treatment was discontinued. Fig. 6 is an X-ray of this case taken by Dr. Caldwell of New York, three months after operation, and shows unmistakably the continuous bone formation over the operative field.

This boy has lived a perfectly unrestrained normal life without any form of external support for 12 months, and there has been no symptom indicating activity of the disease and no increase of deformity.

Case II.—William M., age seven years. Lumbar Pott's disease of two years' duration. Very extensive destruction of the bodies of the three upper lumbar vertebræ. Moderate kyphos. Flexion deformity of both thighs from psoas contraction of 60 degrees. Fluctuating mass in both iliac fossæ.

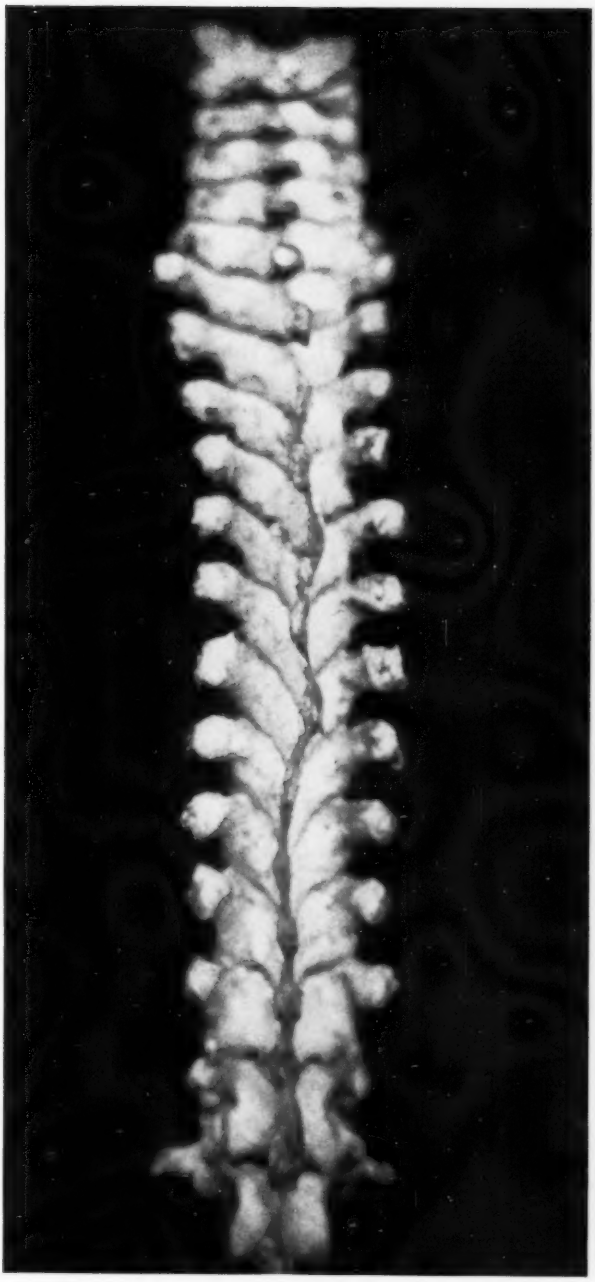
Operation (April 26, 1911).—The operation included the tenth dorsal to the fourth lumbar vertebræ. Fig. 7 is a photograph of the boy before operation, Fig. 8 eleven months after operation, and Fig. 9 is an X-ray which shows the continuous bone formation. He has been without support for eight months and there is no symptom indicating activity of disease, nor has there been any increase of deformity.

There is still, however, some psoas contraction which I believe is due to positive shortening of the muscle, as the flexion of his thighs, which was present at the time of operation, had existed for over a year.

Case III.—Mrs. B., age twenty-five years. Married, two children. Dorsolumbar disease. Marked kyphos from the ninth dorsal to the second lumbar. Disease very active. A large fluctuating mass, left side, extending from the lower border of the ribs, down under Poupart's ligament for six inches on the anterior aspect of the thigh.

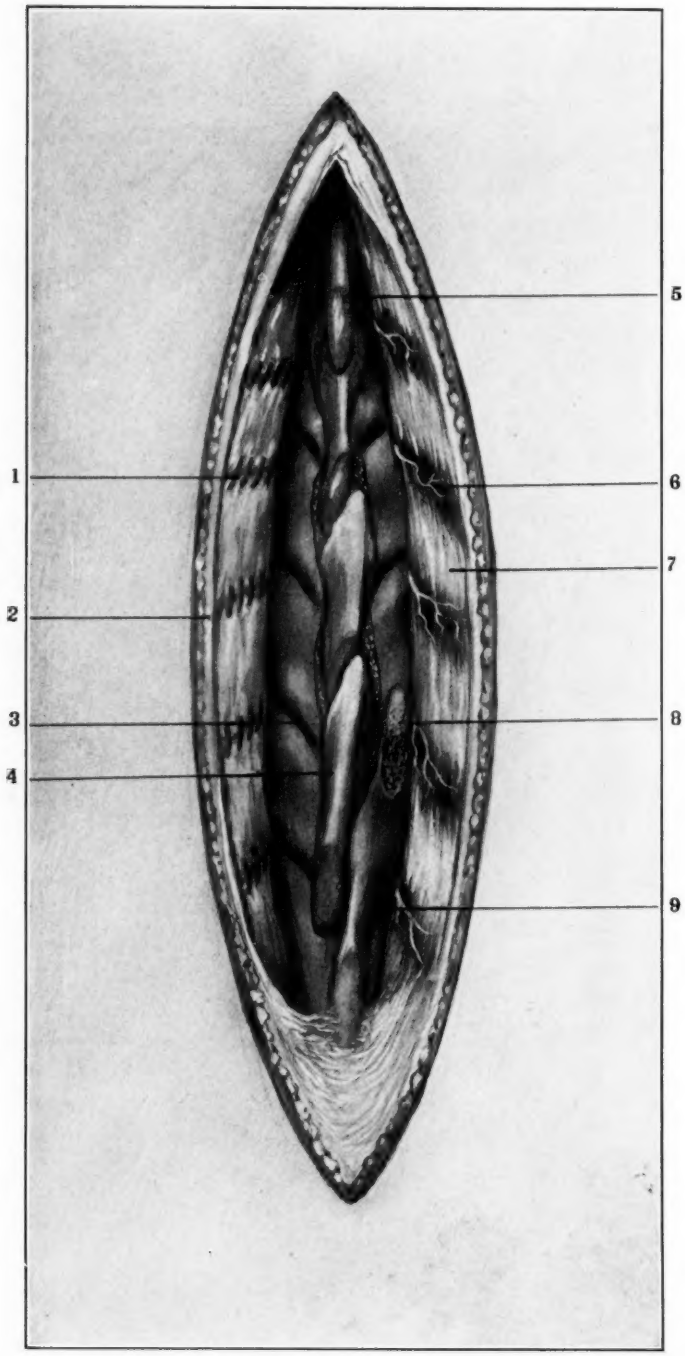
Operation (April 27, 1911).—The operation included the last four dorsal and three upper lumbar vertebræ. A few weeks after operation the abscess was aspirated and has never returned.

FIG. 1.



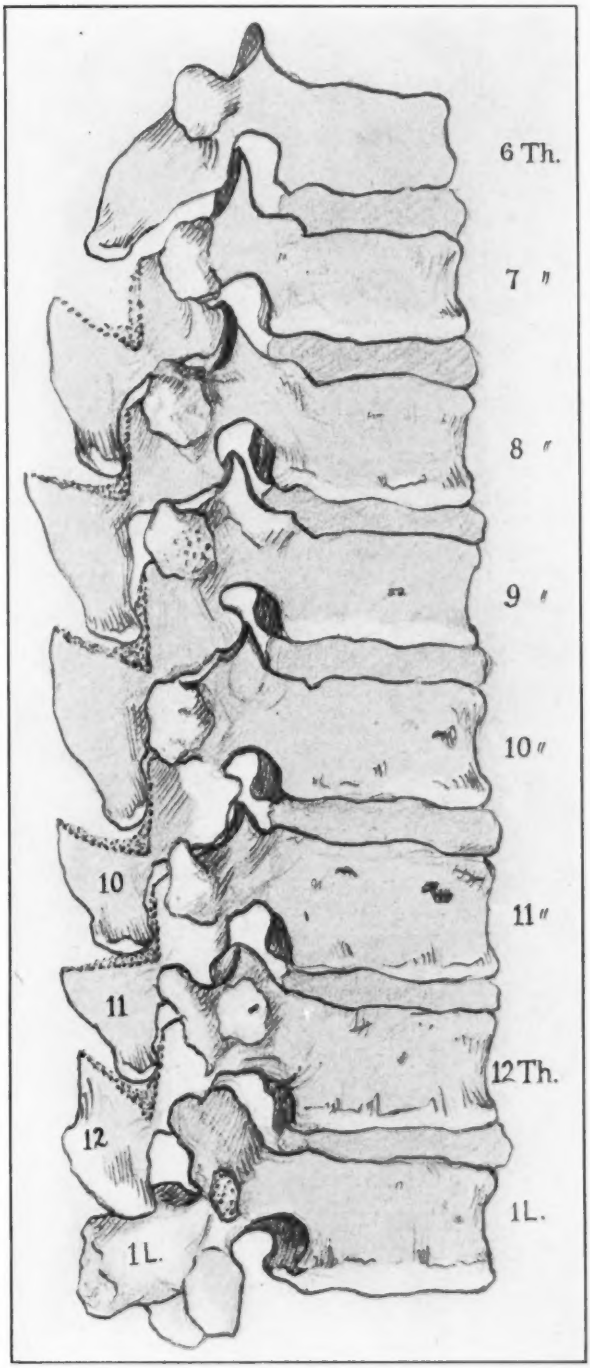
Photograph of a dried preparation of the vertebral column and ligaments.

FIG. 2.



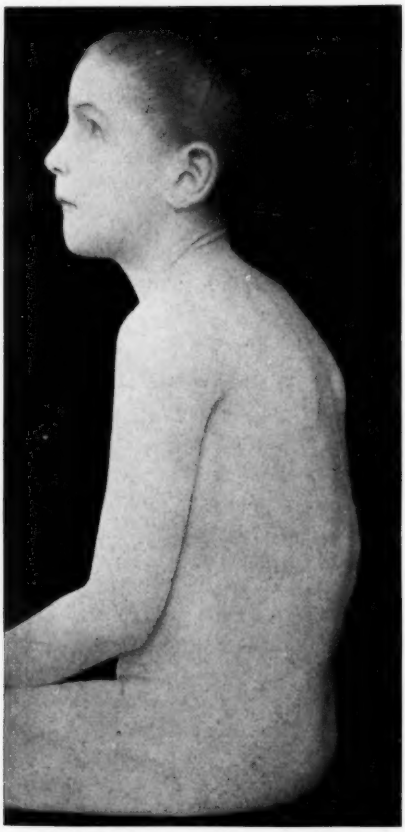
1, shows periosteum sutured; 2, half of supraspinous ligament; 3, space between the adjacent edges of the laminæ; 4, a spinous process transposed by partial fracture, making contact with its own base and the tip with the unbroken spinous process below it; 5, a spinous process marking the upper end of bridge; 4 to 5, transposed spinous processes; 6, space between periosteum when removed from spinous processes and laminæ as it appears before suture; 7, periosteum from spinous processes and laminæ; 8, a small strip of bone elevated from laminæ placed transversely across gap, its free end making contact with the lamina adjacent; 9, spinous process unbroken, marking the lower end of the bridge.

FIG. 3.



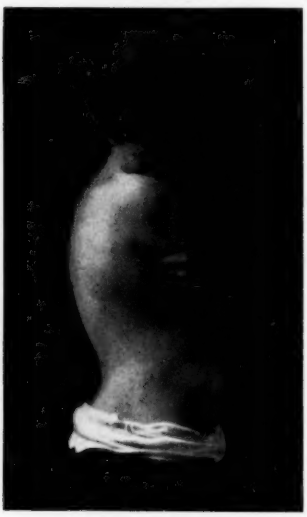
Spinous processes partially fractured and used for bridging the gap between the vertebræ.

FIG. 4.



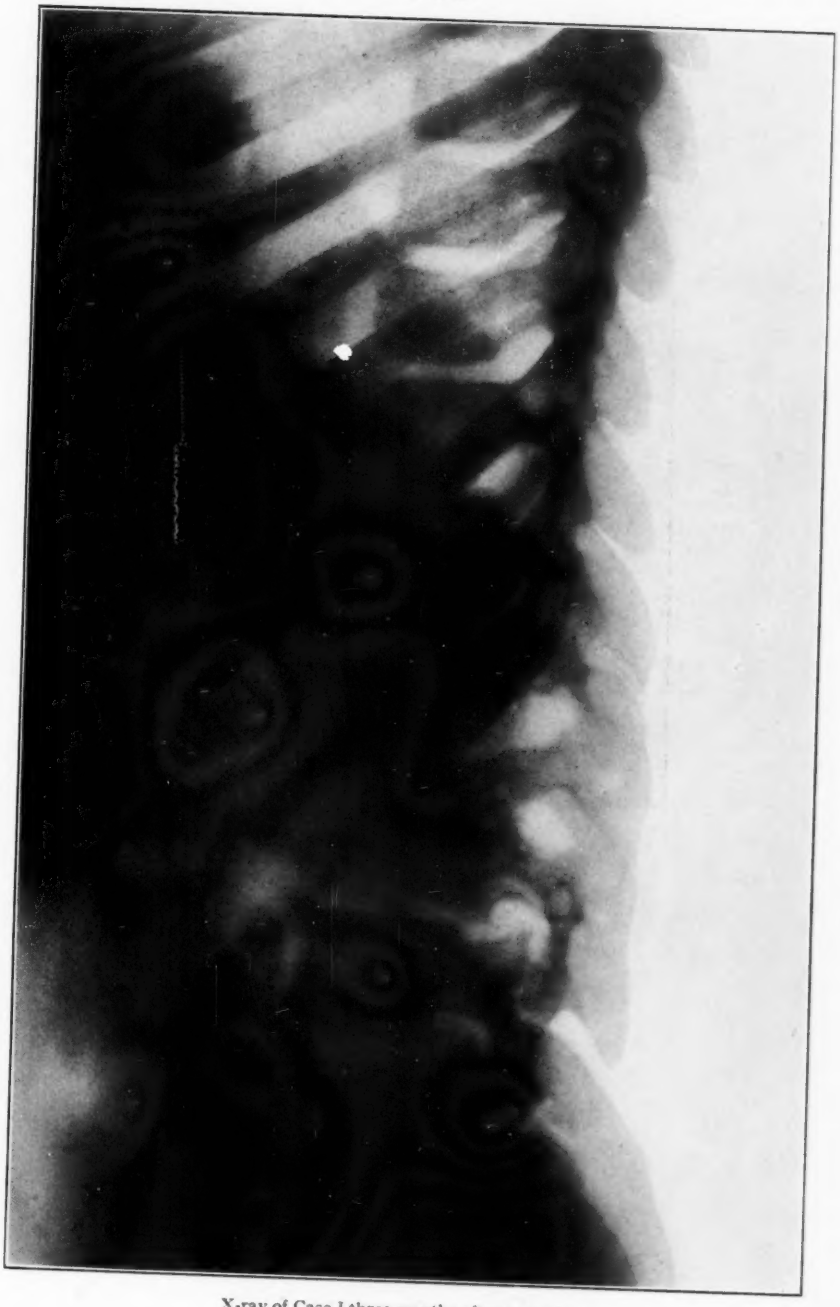
Photograph of Case I before operation.

FIG. 5.



Photograph of Case I fifteen months after operation and twelve months after removal of brace.

FIG. 6.



X-ray of Case I three months after operation.

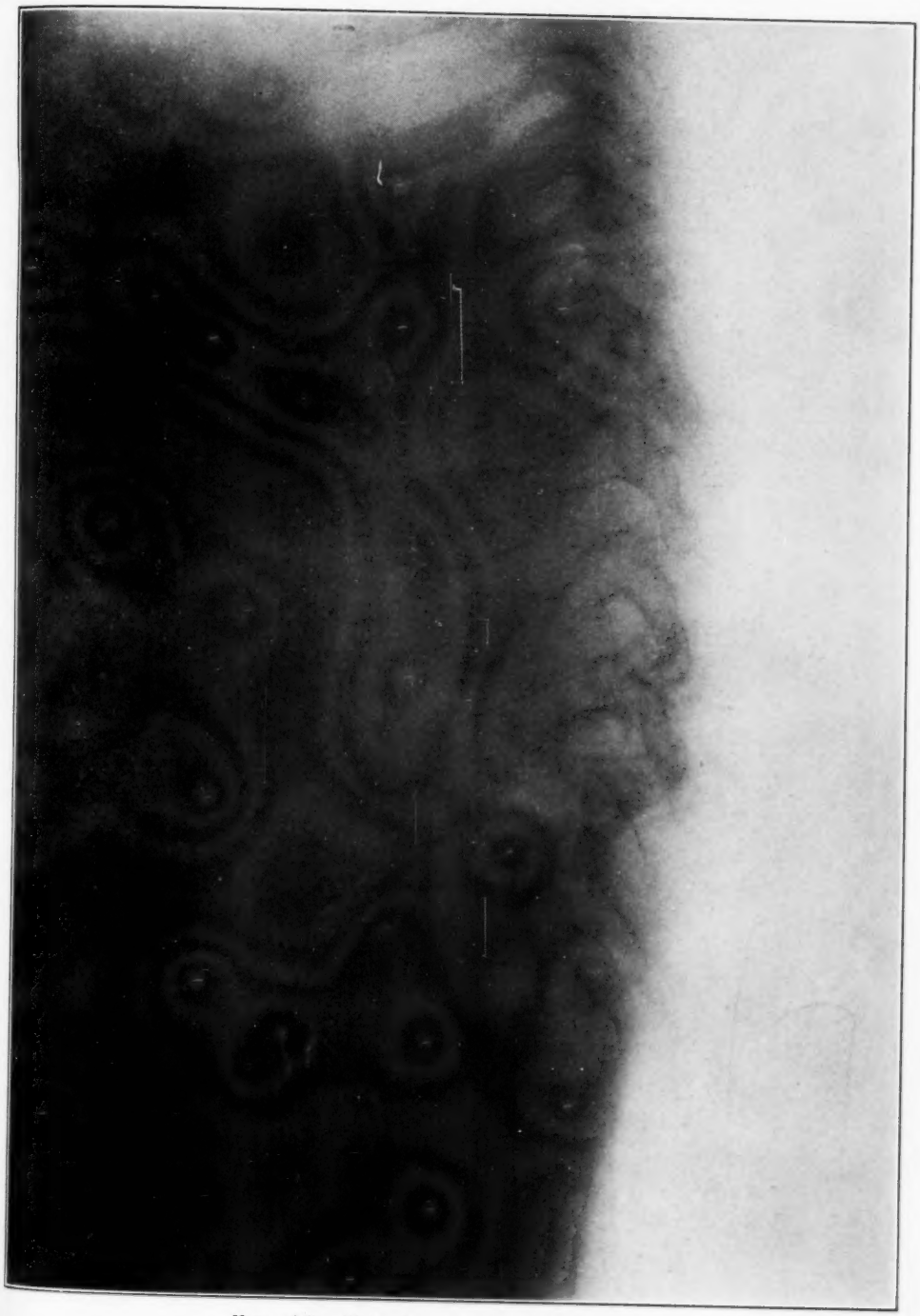
FIG. 7.

Photograph of Case II before operation.

FIG. 8.

Photograph of Case II eleven months after operation.

FIG. 9.



X-ray of Case II showing continuous bone formation.

FIG. 10.

Photograph of Case III before operation.

FIG. 11.

Photograph of Case III eleven months after operation and eight months after removal of brace.

Fig. 10 is a photograph of the patient before operation, and Fig. 11 eleven months after operation.

The very great reduction of her deformity is obvious from these photographs. The X-ray picture taken by Dr. Caldwell, while it shows unmistakably a continuous bone formation, is not sufficiently clear for reproduction on account of the stoutness of the subject. In any case the adequacy of her support is unmistakable, as for eight months she has been without any brace and has lived a perfectly normal life. There has been no symptom indicating activity of her disease and no increase of deformity.

The number of vertebræ in each instance included in the operation is determined by the extent of the disease. It is necessary always to be sure of attaching the diseased vertebræ at either end of the involved area to healthy ones above and below. The extent of the disease may be determined accurately in some cases by X-ray pictures. When this is not possible, the only guide is the kyphos or the region of rigidity.

It is a fact that all the vertebræ involved in the kyphos are not diseased, and that inaccuracy in the number of vertebræ to be operated on is possible. But care should be taken to include a sufficient number, as otherwise the elimination of motion of the diseased joints will not be obtained.

The stiffening of a small segment of the spine in a given case is not a serious matter, in view of the fact that the remaining healthy joints compensate for the loss of function of the few. Indeed is it not a fact that comparatively few cases of Pott's disease recover, with movable joints?

A striking illustration of this is Case III, a woman of twenty-five. While six vertebræ were included in the operation, thus stiffening a long segment of her spine, the spine above and below the field of operation allows such freedom of motion that she shows almost no awkwardness.

In these three patients no attempt was made to close the narrow gaps in the periosteum laterally, as is shown in Fig. 2. In many cases since I have closed these gaps, thus establishing at once continuous periosteum on either side which is sutured together in the middle.

The small space between the laminæ with the gap between the spinous processes filled by their transposition makes me doubt the necessity of thus suturing the periosteum, as I think it becomes continuous and that a fusion of the laminæ and spinous processes of the vertebræ operated on takes place. Certainly the result in these three cases was satisfactory. However the practice of this part of the technic is not difficult.

There are two other features of the technic that have been practised in a number of the cases which seem worthy of emphasis. One is pushing back the periosteum from the adjacent edges of the laminæ to their ventral side, after its removal from their posterior surfaces. This can be done easily with a thin blunt periosteal elevator, without injury to the membrane of the cord. The other is the elevation of a small piece of bone from the laminæ, placing it transversely across the space between them, its free end in contact with the lamina next below, which establishes a bone bridge (Fig. 2).

It has long been the accepted theory that the osteoblast was generated from the periosteum, and for that reason great care has been exercised to remove it without injury.

However, Macewen's[3] experimental studies of bone growth seem to prove that the osteoblast emanates from the bone. Whether it is generated from periosteum or from the bone, or from both, is a question which need not be determined in estimating the value of the surgical procedure under discussion. We have both structures here in abundance, the operation stimulates the generation of the osteoblast, provides a place for its deposit and nutrition between the periosteum and bone, establishes ideal conditions for bone development, insures its continuous formation along the posterior aspect of the vertebræ operated, and produces a fusion of laminæ and spinous processes from the transverse processes of one to those of the other side, thus giving a perfectly symmetrical, extensive, and adequate support.

My experience of the beneficial effects of immobilization,

even when imperfectly obtained by braces and casts, on tubercular disease of vertebral and other articulations, justifies me in believing that a more perfect degree of such immobilization, produced by bony anchorage of the diseased structures in the desired position, will unquestionably be of the greatest help in arresting and controlling the morbid processes, and will rapidly lead to a radical cure of the disease.

From the results in these three patients, I have felt justified in continuing this work and have operated on 33 other patients, making a total of 36—21 in the dorsal, 4 in the lumbar, and 11 in the dorsolumbar region.

Twenty-one were from 3 to 10, 13 from 10 to 15, one 18, and one 25 years of age. The duration of the disease has varied from three months to ten years, in the large percentage under five.

In all, the wounds have healed without complication, pain has been slight, and there has been no reaction from the operation. Eighteen of the cases have been without support from three to seven months, and have shown no symptoms of disease or any increase of deformity.

While it is too early to make a final report on these cases, one other observation has been made in connection with this operative experience, which is of very significant importance. The fact that in six cases, or nearly 17 per cent., a fusion of the laminæ and the spinous processes of two or more vertebræ involved in the kyphos was found.

Five of these cases were under ten years of age, one was sixteen, at the time of operation. The duration of the disease in one was only two years, in four under four years, and in one ten years.

In all six cases the fusion was of vertebræ in the lower segment of the kyphos, in two of three vertebræ, and in four of two vertebræ, but in none was the fusion complete in producing anchorage of the diseased vertebræ to healthy ones both below and above.

The attempt on the part of nature to eliminate motion of these diseased joints by extraordinary bone growth, though

it was incomplete, is very important, as it indicates the principles which should guide the surgeon in attempting to produce this result by operation, and suggests that the procedure herein described, which preserves all the structures essential to the development of bone and stimulates their activity, is consistent with those principles.

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THE CLINICAL FEATURES AND TREATMENT OF ACUTE PERFORATING GASTRIC AND DUODENAL ULCER.

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J. A. CORSCADEN, M.D.,

AND

J. W. JAMESON, M.D.

(Continued from page 569)

The suggested advantages of gastro-enterostomy are also those of jejunostomy advocated by Von Eiselsberg,[115] except for the fact that while the benefit of a jejunostomy consists only in permitting the early resumption of feeding the patient, a gastro-enterostomy, if the anastomosis be of sufficient size, may benefit permanently as well. With the closure of the jejunal fistula, the stomach is in precisely the same condition as if the operation had been restricted merely to the closure of the perforation.

Of the permanent benefits gained by adding a gastro-enterostomy to the closure of a perforation, it is stated that by preventing recurrence of ulceration it at the same time necessarily prevents a remote recurrence of the perforation. Four cases, collected from the literature, of remote perforation after simple suture of a primary perforation in which this accident might have been prevented by a simultaneous gastro-enterostomy were reported by the writer in his previous paper, and to these must be added the case reported by French,[35] in which the recurrence of the perforation took place four years after the primary suture, and the case reported by Mitchell,[82] recurring at the same site some months after the original operation. That such a relapse is not impossible when a gastro-enterostomy is added to the closure of perforation, is demon-

strated by the case reported by Petrén,[102] in which, nine months after the suture of a perforation plus a posterior gastro-enterostomy, a perforation recurred at the site of anastomosis.

Moreover, that gastro-enterostomy will not always prevent perforation is well demonstrated by the cases of remote perforation occurring after gastro-enterostomy for simple ulcer uncomplicated by perforation. Thus the writer collected from the literature and reported in his previous paper eight perforations of this character at some point in the stomach remote from the anastomosis and three others occurring at the anastomosis. To these must be added the case reported by Petrén,[102] Busch,[17] Morton,[90] and Moreau.[84]

Probably one of the strongest pleas in favor of adding a gastro-enterostomy to the closure of a perforation is that such a measure affords permanent relief from the persistence or recurrence of ulcer symptoms. The writer has succeeded in collecting 36 cases in which the persistence of symptoms after the simple closure of a perforation demanded a gastro-enterostomy for their relief. Two others must be added to this number, observed by the writer himself. In one of these, Case III reported in the previous paper, the patient remained well for three and one-half years after the closure of the perforation. The symptoms of ulcer then recurred, and at the end of two years a gastro-enterostomy was done in a German hospital, since which time the patient has been in perfect health.

In the second case a duodenal perforation had been closed by suture and an omental flap; months afterward, the patient having been perfectly well in the interval, symptoms indicating pyloric obstruction with gastric stasis developed and were completely relieved by a posterior gastro-enterostomy.

In all of these cases a gastro-enterostomy at the time of closure of the perforation would probably have obviated a second operation, but it is quite questionable in the writer's opinion whether under these circumstances the operations for the perforation would have resulted without mortality.

As a matter of fact, an analysis of the cases requiring

secondary gastro-enterostomy shows that the interval between the primary closure of the perforation and the secondary gastro-enterostomy, even when only eight or nine days, was sufficient to permit of the patient's recovery from the effect of the primary operation as well as to allow for the subsidence of the peritonitis—facts to which could be ascribed in part at least the absence of mortality associated with the secondary gastro-enterostomy.

Two exceptions to these favorable results occur in the case reported by French,[35] in which after the plication of the peritoneum to form a channel from the abdominal wall to an inaccessible perforation near the cardia, the symptoms of the ulcer persisted and were not relieved either by separation and division of the adhesions or by a subsequent gastro-enterostomy, and in the case reported by Petrén[102] of suture for a perforation on the anterior wall of the stomach followed by suppuration in the abdominal wall. The gastric symptoms persisted and at the end of two years the patient consented to a posterior gastro-enterostomy, which was done without benefit.

The table of cases requiring subsequent gastro-enterostomy for the persistence of gastric symptoms might well be supplemented by another, comprising cases in which the persistence of gastric symptoms warranted a gastro-enterostomy, to which, however, the patients would not consent. Of these, 13 were collected and reported by the writer in his previous paper.[30]

SUTURE FOLLOWED BY SECONDARY GASTRO-ENTEROSTOMY.

(10) Ten successful cases, cited in previous paper.

(11) Cuff:[135] Anterior gastro-enterostomy six weeks after suture of ulcer.

(12) Steinthal:[103] Posterior gastro-enterostomy antecolica anterior three years after original perforation.

(13) ——: Posterior gastro-enterostomy eight weeks after because of recurrent symptoms.

(14) Dege:[136] Gastro-enterostomy on ninth day on account of pyloric obstruction.

(15) Mitchell:[91] Gastro-enterostomy eight days after on account of duodenal obstruction.

(16) Schoemaker:[105] Gastro-enterostomy two months after perforation for belching and gastric pain.

(17) ——: Four weeks after perforation; gastro-enterostomy for retention symptoms of two weeks.

(18) Moynihan:[85] Several months after perforation, gastro-enterostomy for stenosis.

(19) ——: Several months after perforation, gastro-enterostomy for stenosis.

(20) ——: Four years after perforation, hour-glass stomach found.

(21) Mayo:[78] Details not mentioned.

(22) Marnoch:[74] Details not mentioned.

(23) ——: Details not mentioned.

(24) Carwardine:[30] Details not mentioned.

(25) ——: Details not mentioned.

(26) Battle:[7] Anterior gastro-enterostomy two months after perforation. Peptic ulcer 22 months.

(27) ——: Anterior gastro-enterostomy 12 months after perforation.

(28) Allaben:[4] Posterior gastro-enterostomy three weeks after perforation for stenosis. Nineteen months after, gastric carcinoma.

(29) ——: Posterior gastro-enterostomy two months after perforation for stenosis.

(30) Morton:[90] Gastro-enterostomy six months after perforation. Hour-glass stomach found.

(31) Mitchell:[91] Gastro-enterostomy on eighth day after perforation for gastric dilatation.

(32) ——: Gastro-enterostomy 18 months after perforation on account of stenosis.

(33) Eliot: Posterior gastro-enterostomy for stenosis three and a half years after perforation, done in Germany.

(34) ——: Posterior gastro-enterostomy seven months after suture of a pyloric perforation on account of pyloric stenosis.

(35) Miller:[127] Posterior gastro-enterostomy several weeks after the suture of a perforation on account of stenosis. Recovery.

(36) Jopson:[55] Gastro-enterostomy two years after the suture on account of the recurrence of gastric symptoms and stenosis. Recovery.

(37) Patterson:[97] No details mentioned.

(38) ——: No details mentioned.

SUTURE FOLLOWED BY SECONDARY GASTRO-ENTEROSTOMY WHICH FAILED TO RELIEVE THE SYMPTOMS.

(*a*) French:[35] Incomplete suture of perforation near the cardia; subsequent pain not relieved by division of adhesions or a secondary gastro-enterostomy.

(*b*) Petrén:[102] Gastro-enterostomy two years after the suture of a perforation. Symptoms not relieved. Two years after gastro-enterostomy patient was still a semi-invalid.

SUTURE FOLLOWED BY PERFORATION OF COEXISTING ULCERS WITHIN ONE MONTH.

Cited by Brunner:[16] Twelve cases.

(13) Wharton:[129] Nineteen days after closure of gastric ulcer, second perforation closed by suture of which the site is not mentioned.

(14) Ross:[128] One week after closure of duodenal ulcer recurrent perforation. Autopsy showed primary perforation closed. Recurrent perforation an inch or so away in duodenum. Four other ulcers on posterior wall of duodenum. Thinks a gastro-enterostomy at the time of original operation might have saved the man, whose condition was too desperate to permit of its being done.

SUTURE WITH GASTRO-ENTEROSTOMY FOLLOWED BY ULCERS WITHIN ONE MONTH.

(*a*) Schoemaker:[105] Twelve hours after suture with gastro-enterostomy in pyloric perforation. Place at which perforation occurred had been palpated at time of primary operation and no trace of ulcer had been found. Death.

(*b*) Dahlgren:[24] Secondary perforation 12 days after first operation.

(*c*) ——:[24] Secondary perforation 14 days after an anterior gastro-enterostomy with entero-anastomosis, gastrostomy, and typhlostomy in site of original perforation.

SUTURE FOLLOWED BY REMOTE PERFORATION.

(*a*) Cited in previous paper four cases.

(*b*) French:[35] One case four years after excision and suture.

(*c*) Mitchell:[83] One case recurring in same site (duodenum) eight months after suture.

(*d*) Andrew:[3] Perforation on posterior surface six months after suture of one on anterior surface of which there was no trace.

(*e*) Peck:[99] One year after suture duodenal ulcer.

SUTURE WITH GASTRO-ENTEROSTOMY FOLLOWED BY REMOTE PERFORATION.

(*a*) Petrén:[102] Suture with posterior gastro-enterostomy followed two days later by entero-anastomosis on account of threatened vicious circle. Nine months later perforation at site of anastomosis. Operation. Recovery.

(*b*) Wharton:[129] Suture with gastro-enterostomy by Deaver.[27] One year later perforation closed by Wharton. One year later a third perforation closed by Wharton.

(*c*) Maylard:[88] Suture and anterior gastro-enterostomy. Two perforations of peptic ulcers seven months and two years afterward.

SUTURE FOLLOWED BY HEMORRHAGE.

(*a*) Cited by Brunner:[16] Eight cases.

(*b*) Cited by Eliot:[30] One case.

(*c*) Wallis:[117] Hemorrhage 31 days after suture in case complicated on eleventh day with phlebitis and on seventeenth day with pneumonia. Death.

SUTURE WITH GASTRO-ENTEROSTOMY FOLLOWED BY HEMORRHAGE.

(*a*) Steinthal:[108] Seven days after suture with posterior gastro-enterostomy. Death.

(*b*) Mühsam:[68] Twentieth day after posterior gastro-enterostomy and suture. Ulcer diet. Recovery.

(*c*) Dahlgren:[34] Three weeks after suture with posterior gastro-enterostomy and entero-anastomosis. Death.

GASTRO-ENTEROSTOMY FOR ULCER FOLLOWED BY PERFORATION WITHIN ONE MONTH AFTER OPERATION.

(*a*) Collected in previous paper by writer, eight cases.

(*b*) Petrén:[102] Sixteen days after anterior gastro-enterostomy for ulcer. Death.

(*c*) Graf:[39] Perforation one month after gastro-enterostomy for callous ulcer of lesser curvature. Death.

(*d*) Rubritius:[103] Perforation two days after gastro-enterostomy for hour-glass stomach with ulcer on lesser curvature.

(*e*) Collinson:[25] Perforation of jejunal ulcer 13 days after gastro-enterostomy for duodenal ulcer. Death.

(*f*) Hamann:[41] Perforation of jejunal ulcer 26 days after gastro-enterostomy. Death.

GASTRO-ENTEROSTOMY FOR ULCER FOLLOWED BY REMOTE PERFORATION.

(*a*) Collected by writer in previous paper, eight cases remote from site of anastomosis.

(*b*) Petrén:[102] Four months after posterior gastro-enterostomy at point remote from anastomosis. Recovery.

(*c*) Busch:[17] Seven months after posterior gastro-enterostomy for a pyloric ulcer.

(*d*) Three cases cited by author in previous paper occurring at anastomosis.

(*e*) Morton:[90] Three and a half months after gastro-enterostomy occurring at junction. Repeated three and a half months later.

(*f*) Moreau:[84] Perforation of ulcer at site of gastro-enterostomy done seven years before.

GASTRO-ENTEROSTOMY FOR ULCER FOLLOWED BY HEMORRHAGE.

(*a*) Krogius:[59] Six days after posterior gastro-enterostomy. Death.

(*b*) Three weeks after anterior gastro-enterostomy with entero-anastomosis. Death.

(*c*) Krogius:[59] One day after anterior gastro-enterostomy with entero-anastomosis. Death.

(*d*) Küttner:[64] Two cases, one day and three weeks after gastro-enterostomy, type not mentioned.

(*e*) Borszeky:[13] One case, fatal four hours after gastro-enterostomy from peptic ulcer of œsophagus.

One case, fatal 12 days after gastro-enterostomy from peptic ulcer of œsophagus.

(*f*) Dahlgren:[24] One case died eight days after gastro-enterostomy from an ulcer of the body eroding the splenic artery.

One case died four days after gastro-enterostomy from an ulcer of the body eroding an artery in the pancreas.

One case died 36 hours after gastro-enterostomy from an ulcer of the duodenum eroding the portal vein.

(*g*) Hofmann:[48] One case of fatal hemorrhage 29 days after gastro-enterostomy for callous gastrohepatic ulcer.

(*h*) Kreuzer:[58] One case of fatal hemorrhage from a pyloric ulcer two days after gastro-enterostomy.

(*i*) Kramer:[57] One case of fatal hemorrhage from pyloric ulcer 25 days after gastro-enterostomy.

(*j*) Lambotte:[60] One case of severe hemorrhage immediately after gastro-enterostomy. Recovery.

(*k*) Mayer:[77] One fatal case seven days after gastro-enterostomy for hour-glass stomach.

One fatal case eight days after gastro-enterostomy for pyloric obstruction (jejunal ulcer).

One fatal case 10 days after gastro-enterostomy for multiple ulcers.

(*l*) Rubritius:[103] One fatal case 10 days after gastro-enterostomy for hour-glass stomach.

One severe case immediately post-operation. Relaparotomy and ligature of bleeding vessel in gastro-enterostomy wound. Recovery.

(*m*) Vautrin:[113] Two cases of bleeding duodenal ulcer died one and two days respectively after gastro-enterostomy.

(*n*) White:[119] One case died shortly after gastro-enterostomy for gastric ulcer.

(*o*) Mayer:[77] One case of fatal hemorrhage one year after gastro-enterostomy for ulcer, site not stated.

One case of ulcer of the body died three months after gastro-enterostomy of acute inanition accompanied by vomiting of blood.

(*p*) Schulz:[106] One severe case 16 months after gastro-enterostomy for pyloric ulcer.

(*q*) Vautrin:[113] One severe case 15 months after gastro-enterostomy for bleeding ulcer.

(*r*) Dahlgren:[24] One case of ulcer of the body had severe hemorrhages 10 days after gastro-enterostomy and frequently after the second year until lost sight of in the eighth year.

(*s*) Deaver:[27] One case died of inanition with blood in the stools two months after gastro-enterostomy.

(*t*) Hofmann:[48] One case of repeated severe hemorrhages beginning in the second year post-operation and lasting over a period of five years.

(*u*) Kreuzer:[58] One case of severe hemorrhage 13 months after gastro-enterostomy for florid pyloric ulcer.

(*v*) Kramer:[87] One case of fatal hemorrhage from an ulcer at the site of a gastro-enterostomy, occurring 14 days after a resection done because of repeated hemorrhages following the gastro-enterostomy.

GASTRO-ENTEROSTOMY FOR ULCER FOLLOWED BY CARCINOMA.

(*a*) Graf:[89] Four and one-half years after posterior gastro-enterostomy with button, carcinoma of the stomach with glandular metastasis.

(*b*) Allaben:[3] Carcinoma 19 months after a posterior gastro-enterostomy.

(*c*) Bamberger:[6] In his voluminous statistics finds carcinoma in 2 per cent. of cases developing in old ulcer after gastro-enterostomy.

GASTRO-ENTEROSTOMY AT TIME OF CLOSURE OF PERFORATION—RECOVERIES.

No. 1. Braun:[13] Closed by omental flap. Anterior gastro-enterostomy. Well three and a half years.

Nos. 2, 3. Patterson:[97] Gastro-enterostomy. Well 24 and 15 months.

Nos. 4, 5. Moynihan:[85] Suture and posterior gastro-enterostomy.

No. 6. Brentano:[14] Suture and anterior gastro-enterostomy and entero-anastomosis. Recurrent perforation months after. Posterior gastro-enterostomy.

No. 7. Musser and Keen:[80] Operation 6 hours after perforation. Closure; gastro-enterostomy with Murphy button. Retention of button.

No. 8. Caird:[15] Female, 22. Operation 19 hours after perforation. Closure and posterior gastro-enterostomy for recurrence 13 months after primary operation.

No. 9. Caird: Male, 35. Closure and posterior gastro-enterostomy.

No. 10. Caird: Closure and posterior gastro-enterostomy on account of constriction.

No. 11. Howitt:[40] Excision, suture and anterior gastro-enterostomy, Murphy button for pyloric.

No. 12. Noetzel:[94] Male, 31. Operation 9 hours after perforation. Excision, suture and posterior gastro-enterostomy. Patient well two and a half years.

No. 13. Noetzel: Male, 33. Operation 40 hours after perforation. Excision, suture for pyloric.

No. 14. Noetzel: Male, 25. Excision, suture for pyloric. General peritonitis.

No. 15. Haim:[40] Female, 70. Operation 5 hours after perforation. Closure and posterior gastro-enterostomy for pyloric. Suture constriction.

No. 16. Körte:[54] Posterior gastro-enterostomy, dilatation of the stomach.

No. 17. Brentano:[14] Posterior gastro-enterostomy, thickening of pylorus.

No. 18. *Ibid.:* Posterior gastro-enterostomy, callous edges of ulcer.

Nos. 19, 20. *Ibid.:* Posterior gastro-enterostomy, suture constriction.

No. 21. Hartwell:[42] Closure and posterior gastro-enterostomy, Murphy button, suture constriction.

No. 22. Brewer:[15] Closure and posterior gastro-enterostomy for recurrent perforation.

No. 23. Martin:[89] Closure and posterior gastro-enterostomy, Murphy button, suture constriction.

No. 24. Petrén:[103] Operation 6½ hours after perforation. Excision, suture, anterior gastro-enterostomy, antecolica and entero-anastomosis.

No. 25. *Ibid.:* Operation 11 hours after perforation. Excision, suture, posterior gastro-enterostomy, entero-anastomosis third day for vicious circle.

No. 26. Steinthal:[106] Operation 2 hours after perforation. Suture and posterior gastro-enterostomy for perforation near pylorus.

No. 27. *Ibid.:* Operation 4 hours after perforation. Suture and posterior gastro-enterostomy for perforation near pylorus.

No. 28. *Ibid.:* Operation 12 hours after perforation. Suture and posterior gastro-enterostomy for perforation near pylorus.

No. 29. *Ibid.:* Operation 7 hours after perforation. Suture and posterior gastro-enterostomy for perforation near pylorus.

No. 30. Muhsam:[86] Operation 12 hours after perforation. Suture and posterior gastro-enterostomy for perforation near pylorus.

No. 31. *Ibid.:* Operation 3 hours after perforation. Suture and posterior gastro-enterostomy for perforation near pylorus. Recovery complicated by bloody stool twentieth day.

No. 32. *Ibid.:* Operation 3 hours after perforation. Suture and posterior gastro-enterostomy for upper pyloric perforation.

No. 33. *Ibid.:* Operation 12 hours after perforation. Suture and posterior gastro-enterostomy (Murphy) for perforation duoden. pyloric.

No. 34. *Ibid.:* Operation 22 hours after perforation. Suture and anterior gastro-enterostomy, antecolica; perforation upper posterior pylorus.

No. 35. Kroiss:[62] Operation 28 hours after perforation. Suture and posterior gastro-enterostomy, Murphy. Complication thrombosis.

No. 36. *Ibid.:* Operation 18 hours after perforation. Gastro-enterostomy, antecolica posterior, Murphy. Mesocolon contracted.

No. 37. *Ibid.:* Operation 21 hours after perforation. Posterior gastro-enterostomy, Murphy. Pylorus probably closed.

No. 38. Blake:[11] Operation 4 hours after perforation. Suture and posterior gastro-enterostomy for pyloric perforation.

No. 39. Murphy:[87] Operation 9 hours after perforation. Suture and posterior gastro-enterostomy, suture constriction.

Nos. 40, 41, 42. Moynihan:[88] No details given.

Nos. 43, 44, 45. Mayo:[78] Suture and posterior gastro-enterostomy.

No. 46. Morton:[90] Details not given.

No. 47. McWilliams:[73] Operation 6 hours after perforation. Suture and posterior gastro-enterostomy for pyloric perforation.

No. 48. *Ibid.:* Operation 12 hours after perforation. Suture and posterior gastro-enterostomy for pyloric perforation.

No. 49. *Ibid.:* Operation 7 hours after perforation. Suture and posterior gastro-enterostomy for pyloric perforation.

No. 50. Downes:[39] Posterior gastro-enterostomy and overlapping of the gall-bladder, pyloric.

No. 51. Harrison:[40] Suture and posterior gastro-enterostomy anterior wall. Empyema and fecal fistula.

No. 52. Carwardine:[30] No details.

No. 53. *Ibid.:* No details.

No. 54. Maylard:[88] Suture and anterior gastro-enterostomy. Seven months later perforation, peptic ulcer 1½ inches below anastomosis. Two years later perforation in efferent jejunum close to mesentery one inch below.

No. 55. Finsterer:[83] Operation 10 hours after perforation. Suture and posterior gastro-enterostomy, suture stenosis.

No. 56. Noall:[92] Operation 42 hours after perforation. Suture and posterior gastro-enterostomy for duodenal perforation.

No. 57. Woolsey:[128] Operation 6 hours after perforation. Suture and posterior gastro-enterostomy for perforation near pylorus.

Nos. 58, 59, 60, 61. Mitchell:[91] All within fifth hour, posterior gastro-enterostomy. No details.

No. 62. *Ibid.:* Operation 4 hours after perforation. Anterior gastro-enterostomy (fat mesocolon) for recurrent duodenal perforation.

No. 63. Pernitza:[101] Operation 6 hours after perforation. Suture and posterior gastro-enterostomy, suture constriction, anterior pylorus.

No. 64. Krogius:[89] Operation 3 hours after perforation. Suture and posterior gastro-enterostomy, suture constriction, anterior pylorus.

No. 65. Milko:[81] Operation 3 hours after perforation. Gastro-enterostomy, marked pyloric stenosis, later entero-anastomosis, vicious circle.

No. 66. Stirling:[110] Operation 9 hours after perforation. Suture and posterior gastro-enterostomy, pyloric stenosis.

Nos. 67, 68. Lundblad:[100] Suture and posterior gastro-enterostomy, Murphy button for pyloric perforation.

No. 69. Kronlein:[41] Operation 5 hours after perforation. Suture and posterior gastro-enterostomy and entero-anastomosis for pyloric perforation.

No. 70. *Ibid.:* Operation 5 hours after perforation. Suture and posterior gastro-enterostomy and entero-anastomosis for duodenal perforation.

No. 71. Von Khautz:[116] Operation 6 hours after perforation. Suture and posterior gastro-enterostomy for pyloric ulcer with induration.

No. 72. *Ibid.:* Operation 3 hours after perforation. Suture and posterior gastro-enterostomy for pyloric perforation.

No. 73. Lecene:[86] Operation 6 to 12 hours after perforation. Suture and posterior gastro-enterostomy for perforation on lesser curvature.

No. 74. *Ibid.:* Operation 6 to 12 hours after perforation. Suture and posterior gastro-enterostomy for perforation on lesser curvature.

No. 75. *Ibid.:* Operation 6 to 12 hours after perforation. Suture and posterior gastro-enterostomy for duodenal perforation.

No. 76. Dandelski:[35] Operation 4 hours after perforation. Suture and posterior gastro-enterostomy for perforation anterior pylorus.

No. 77. Sonnenburg:[107] Operation 30 hours after perforation. Suture and posterior gastro-enterostomy and omental flap for callous pyloric. Murphy button.

No. 78. Nordmann:[95] Operation 6 hours after perforation. Excision, suture and posterior gastro-enterostomy for perforation, induration, lesser curvature.

No. 79. *Ibid.:* Operation 2 hours after perforation. Suture and posterior gastro-enterostomy for pyloric perforation complicated by pneumonia.

No. 80. Hofmeister:[47] Operation 20 hours after perforation. Suture and posterior gastro-enterostomy for perforation of duodenum.

No. 81. Monnier:[79] Operation 20 hours after perforation. See Kroiss table. Reference not found.

No. 82. Ward:[115] Operation 6 hours after perforation. See Kroiss table. Reference not found.

No. 83. *Ibid.:* See Kroiss table. Reference not found.

No. 84. Wickerhauser:[120] Operation 4¾ hours after perforation. See Kroiss table. Reference not found.

No. 85. Falkenburg:[31] Operation 20 hours after perforation. From Kroiss table. Reference not given.

No. 86. Körte:[56] Suture and posterior gastro-enterostomy, suture constriction.

No. 87. Brentano:[14] Suture and posterior gastro-enterostomy, suture constriction.

No. 88. Petrén:[102] Operation 8 hours after perforation. Suture and gastro-enterostomy, antecolica anterior for duodenal perforation.

No. 89. Blake:[11] Male, 31. Operation 3 hours after perforation. Suture and posterior gastro-enterostomy for pyloric perforation in indurated ulcer.

GASTRO-ENTEROSTOMY AT TIME OF CLOSURE OF PERFORATION—FATALITIES.

No. 1. Moynihan:[85] Details not given.

No. 2. Caird:[18] Female, 37. Operation 17 hours after perforation. Suture and posterior gastro-enterostomy for large pyloric perforation; suture constriction.

No. 3. *Ibid.:* Female, 31. Operation 10 hours after perforation. Suture and posterior gastro-enterostomy for pyloric perforation; suture constriction.

No. 4. *Ibid.:* No details; posterior gastro-enterostomy necessary from suture constriction.

No. 5. *Ibid.:* No details; posterior gastro-enterostomy necessary from suture constriction.

No. 6. Miles:[80] Male, 49. Suture and posterior gastro-enterostomy for thickened pyloric perforation.

No. 7. *Ibid.:* Suture and posterior gastro-enterostomy for duodenal perforation; suture constriction.

No. 8. Noetzel:[94] Male, 23. Operation 72 hours after perforation.

Excision, suture and omental flap for pyloric perforation, posterior gastro-enterostomy.

No. 9. *Ibid.:* Male, 65. Operation 3 hours after perforation. Suture and omental flap for pyloric perforation, Murphy button, posterior gastro-enterostomy.

No. 10. Körte:[88] Operation 24 hours after perforation. Suture and posterior gastro-enterostomy, suture constriction.

No. 11. *Ibid.:* Operation 24 hours after perforation. Suture and posterior gastro-enterostomy, suture constriction.

No. 12. Petrén:[102] Operation 6 hours after perforation. Suture and gastro-gastrotomy for perforation. Hour-glass stomach.

No. 13. Petrén:[102] Operation 1 hour after perforation. Suture and gastro-enterostomy, antecolica anterior. Death from vicious circle.

No. 14. *Ibid.:* Operation 23 hours after perforation. Suture and gastro-enterostomy, antecolica anterior, entero-anastomosis, stenosis of pylorus.

No. 15. *Ibid.:* Operation 3 hours after perforation. Suture imperfect for perforation on posterior pylorus, posterior gastro-enterostomy.

No. 16. Jaffe:[58] Operation 16 hours after perforation. Posterior gastro-enterostomy, suture constriction. Death the result of gastro-enterostomy.

No. 17: Steinthal:[108] Operation 6 hours after perforation. Posterior gastro-enterostomy, Murphy button. Death 7th day from hemorrhage.

No. 18. *Ibid.:* Operation 7 hours after perforation. Posterior gastro-enterostomy, Murphy button. Death 3½ months from subphrenous abscess.

Nos. 19, 20. Mayo:[78] Suture and posterior gastro-enterostomy.

No. 21. Dahlgren:[24] Suture and anterior gastro-enterostomy, entero-anastomosis for pyloric perforation. Death 12 days later from recurrent perforation.

No. 22. *Ibid.:* Death from gastric and intestinal hemorrhage 3 weeks after.

No. 23. *Ibid.:* No details given.

No. 24. Finsterer:[33] Operation 7 hours after perforation. Suture and posterior gastro-enterostomy, pyloric-duodenal perforation, pneumonia eighth day.

No. 25. Downes:[29] Posterior gastro-enterostomy, suture constriction. Death eighth day from pneumonia.

No. 26. Von Khautz:[110] Operation 3 hours after perforation. Suture and posterior gastro-enterostomy for pyloric perforation.

No. 27. *Ibid.:* Operation 8 hours after perforation. Suture and posterior gastro-enterostomy for posterior pyloric. Death from peritonitis.

No. 28. Borszeky:[12] Operation 96 hours after perforation. Excision, suture and posterior gastro-enterostomy for duodenal perforation. Death 6 hours after.

No. 29. Leriche:[67] Operation 12 hours after perforation. Suture impossible, large callous pyloric ulcer, gastro-enterostomy with extra-peritoneal suture of pylorus.

No. 30. Nordmann:[88] Operation 24 hours after perforation. Excision of edges, suture and posterior gastro-enterostomy for anterior pyloric perforation. Death sixth week after from meningitis.

A condensed tabulation of the foregoing cases gathered from the literature and from the writer's experience gives a total of 75 cases in which a gastro-enterostomy added to the closure of a perforation might have prevented the occurrence of either some further complication or the persistence of the ulcer symptoms:

After suture only: (*a*) perforation of coexisting ulcers within one month after suture of the primary perforation, 14; (*b*) hemorrhage from coexisting ulcers, 10; (*c*) remote perforations, 8; (*d*) persistence of symptoms relieved by gastro-enterostomy, 38; (*e*) persistence of symptoms indicating gastro-enterostomy, in which the operation was refused by the patients, 19.

In contrast to this table, however, is one in which gastro-enterostomy added to the closure of the perforation failed to prevent subsequent complication.

After suture plus gastro-enterostomy: (*a*) perforation of coexisting ulcers within one month, 3; (*b*) hemorrhage from coexisting ulcers, 3; (*c*) remote perforations, 15; (*d*) persistence of symptoms not relieved by secondary gastro-enterostomy, 2.

The supposed disadvantages of adding a gastro-enterostomy to the closure of a perforation have already been enumerated. In regard to the prolongation of the operation, it may be stated that in many cases, especially shortly after perforation, the general condition of the patient is such that an added gastro-enterostomy does not materially increase the risk. In other cases in which the peritonitis is advanced or virulent, the condition of the patient renders an early termination of the operation imperative, and a gastro-enterostomy should be done only in those rare instances in which the suture of the perforation closes the lumen of the gut. There are a considerable number of border-line cases, and while the writer feels that here a gastro-enterostomy, if rapidly and skilfully

done, would scarcely increase the risk, yet it must be recognized that the operation is one of emergency and that these patients may fall to the lot of one relatively inexperienced in the technic of intestinal anastomosis. If this proves to be the case, the chances of recovery will be materially increased by the omission of the gastro-enterostomy. The argument frequently advanced that the addition of a gastro-enterostomy barely prolongs the operation for ten minutes should be modified by stating that only in the hands of the most experienced and skilled surgeons can this operation be completed in such a short time. As a matter of fact, the writer believes that even in skilled hands anastomosis by suture prolongs an operation for perforation by considerably more than ten minutes. Thus, in three cases to which the writer refers, the total duration of closure of the perforation plus gastro-enterostomy by suture required between one hour and five and one hour and fifteen minutes, whereas the average time for the closure of a perforation is, in the writer's personal experience, between 20 and 40 minutes. In other words, in operations of emergency which frequently must be done by the general surgeon rather than by the most skilled and experienced, it is unwise and even dangerous, in order to gain some slight advantage, to advocate a method of treatment which cannot generally be adopted without detriment to the patient. To be sure, if speed is essential, a gastro-enterostomy can be done with a Murphy button or other mechanical contrivance, but the opening made in this way may ultimately contract, and in that event can benefit only for as long as it remains patent. Notwithstanding the fact, however, that its benefit may not be as permanent as if a larger opening had been made by suture, its advocates assert that the opening continues patent for months if not for years, and that it not only affects favorably the immediate post-operative condition of the patient but has many of the more remote advantages of a gastro-enterostomy as well. That, however, a gastro-enterostomy added to the closure of a perforation is so markedly advantageous as its advocates maintain is not at all certain. In the preceding discussion it was shown that perforations closed without gastro-enterostomy remained as

secure as those in which this measure had been added and that, in these same cases, post-operative feeding was begun as early and as safely as in cases of gastro-enterostomy for pyloric stenosis without perforation. If, then, gastro-enterostomy added to the closure of a perforation is of no immediate benefit and the remote benefit depends upon the permanence of the patency of the opening, it follows, notwithstanding the longer time required for its performance, that a gastro-enterostomy by the suture method rather than by the button or other mechanical contrivance must be the operation of choice and that, if the patient's condition does not justify the relatively longer operation, it is wiser to limit it to the mere closure of the perforation and to postpone the gastro-enterostomy until it shall have been indicated if at all by persistent or relapsing symptoms. It is only in these rare cases in which the closure of the perforation totally occludes the lumen of the bowel and in which the general condition of the patient is such as to necessitate the shortest possible operation, that a gastro-enterostomy by the button rather than by the suture is indicated.

The second argument advanced against an added gastro-enterostomy is the possibility of its opening a direct path of infection into the lesser peritoneal cavity. This argument, based upon sound theory, has proved fallacious in actual practice. The writer has found no instance of a fatality which could be ascribed to a spread of the infectious material in this direction. In the first place, the peritoneal exudate is apt to be much less infectious below the level of the transverse colon than in the neighborhood of the perforation, while the lesser cavity proper is opened through the transverse mesocolon in its most dependent part. Furthermore, any possible spread of the infection is ordinarily prevented by carefully cleaning the site of the proposed gastro-enterostomy, while the lesser cavity itself is excluded from infection by the sutures which join the edges of the divided mesocolon to the posterior surface of the stomach.

In the next place, gastro-enterostomy for simple ulcer without perforation does not always relieve that condition even

in those cases of simple ulcer in which it seems urgently indicated.

In the following tabulation of late results, as reported by each observer, there are considered: number of cases; cured; improved; not improved; died later from gastric disease; cases coming to secondary laparotomy; cases not known; and those dying of intercurrent disease.

ULCER OF PYLORUS AND PYLORIC END OF STOMACH

Reference	Variety	No.	Cured	Improved	Not improved	Died	Relaparotomy	Not known	Intercurrent death	
Borszeky[12]	Ulcus callosum	5	4	..	1	..	(1)	..	..	
	Lesser curve near pylorus	1	..	..	1	..	..	..	..	
	Stenosis	12	9	..	1	..	(1)	2	..	
Clairmont[19]	.....	110	57	11	15	8	..	19	..	
Dahlgren[24]	Diagnosed	1	..	..	..	1	..	..	..	Died 1½ years of carc. vent.
	Stenosis	7	5	..	1	..	..	..	1	
	Tumor	6	5	..	..	1	..	..	..	(1)Died 1¾ years of carcinoma?
	Infiltrating	7	3	3	1	..	..	..	..	
Deaver[27]	.....	27	16	4	3	2	(2)	..	2	
Gaudemet[36]	.....	20	2	1	1	..	..	16	..	
Gilli[37]	Stenosis	18	12	4	1	..	(2)	1	..	
	Ulcer	2	..	1	..	..	..	1	..	
	Tumor	3	..	1	..	1	..	1	..	
Ito and Sayesima[61]	Stenosis	21	11	2	1	..	..	7	..	
Kramer[57]	Ulcer stenosis	33	19	10	4	..	..	..	..	
Kreuzer[58]	.....	59	34	12	6	2	(4)	5	..	(1) Died 3½ yrs. of carcinoma?
Lambotte[68]	Stenosis	8	6	1	1	..	..	..	..	
	Ulcer	25	22	..	3	..	..	..	..	One case died later of secondary carcinoma.
Lieblein[70]	Stenosis	1	1	..	..	..	..	..	..	
	Callous ulcer	3	1	1	1	..	..	..	..	
Mayer[77]	Stenosis	29	12	9	2	..	..	..	6	
Nyrop[86]	Stenosis	23	14	5	3	..	..	..	1	
	Tumor	7	4	2	..	1	..	..	..	
Rubritius[103]	Ulcer	20	9	..	3	4	..	2	2	Four died later of carcinoma.
	Stenosis	29	14	7	4	2	(4)	..	2	
Denechau[28]	Stenosis	42	12	22	8	..	..	..	..	
	Ulcer	17	5	11	1	..	..	..	..	
Graf[39]	Stenosis	23	8	8	6	..	..	..	1	
	Ulcer	16	8	4	4	..	(4)	..	..	
Hofmann[48]	.....	21	16	2	1	..	..	2	..	
Schmitt[104]	.....	25	18	6	1	..	..	..	..	
Schulz[108]	.....	36	22	7	2	2	(1)	2	1	
Stumpf[111]	.....	9	6	2	1	..	..	..	..	
Moreau[84]	.....	27	11	5	10	1	..	..	..	One case carcinoma.
		693	366	141	87	25		58	16	
		74						16		
		619	507 81.9%		112 18.1%			74		

Percentage of good results with operative mortality considered, 76.9.

ULCERS OF LESSER CURVATURE AND OF BODY DISTANT FROM PYLORUS

Reference	Variety	No.	Cured	Improved	Not improved	Died	Relaparotomy	Not known	Intercurrent death	
Borszeky[12]	Bleeding	1	1	..	..	..	..	..	..	
Clairmont[19]	.....	30	9	5	9	6	..	1	..	
Dahlgren[24]	.....	7	5	1	..	..	..	..	1	
Gaudemet[36]	.....	8	2	3	1	2	..	..	..	
Gilli[37]	.....	8	5	3	..	..	(2)	..	..	
Kreuzer[58]	.....	4	2	2	..	..	(1)	..	..	
Lambotte[64]	.....	5	3	0	..	..	..	2	..	
Lieblein[70]	Callous	4	1	1	1	1	(1)	..	..	Resected specimen showed invading epithelial cells. One case died later of carcinoma.
Mayer[77]	.....	1	..	1	..	..	..	..	..	
Nyrop[86]	Tumor	6	3	2	1	..	..	..	..	
Rubritius[103]	.....	9	7	1	..	1	..	..	..	
Denechau[28]	.....	11	2	8	1	..	..	..	..	
Graf[39]	.....	14	6	..	3	2	..	3	..	
Hofmann[48]	.....	6	3	1	1	..	..	1	..	
Schmitt[104]	.....	6	2	4	..	..	..	..	..	
Schulz[106]	.....	8	7	1	..	..	..	..	..	
Stumpf[111]	.....	3	1	1	1	..	..	..	..	
		131	59	34	18	12		7	1	
		8								
		123	93		30			8		
			75.5%		24.5%					

Percentage of good results with operative mortality considered, 70.9.

DUODENAL ULCER

Reference	Variety	No.	Cured	Improved	Not improved	Died	Relaparotomy	Not known	Intercurrent death	
Borszeky[12]	.....	1	1(4mo.)	..	..	..	..	..	..	
Clairmont[19]	.....	11	6	2	2	1	..	..	..	
Dahlgren[24]	.....	1	..	1	..	..	..	..	..	
Deaver[27]	.....	10	8	2	..	..	..	..	..	
Lieblein[70]	.....	2	1	1	..	..	..	..	..	
Nyrop[86]	.....	2	1	..	..	1	..	..	..	Carcinoma.
Schmitt[104]	.....	7	3	4	..	..	..	..	..	
		34	20	10	2	2				
		34	30		4					
			85%		15%					

Percentage of good results with operative mortality considered, 79.9.

POSITION NOT STATED

Reference	Variety	No.	Cured	Improved	Not improved	Died	Reoperated	Not known	Intercurrent death	
Bidwell[18]	.....	81	46	21	14	..	(5)	..	..	
Busch[17]	.....	64	56	5	..	3	..	..	..	Three died of carcinoma?
Dahlgren[24]	Diagnosed	2	1	..	1	..	..	..	..	
	Bleeding	1	..	1	..	..	..	..	..	
Deaver[27]	.....	16	7	3	3	1	(1)	..	2	
Gilli[27]	.....	6	1	3	1	..	(1)	1	..	
Küttner[42]	Ulc. callosum	12	2	1	4	5	..	..	..	Five died of carcinoma.
Gaudemet[28]	.....	2	1	..	..	..	..	1	..	
Mayer[77]	.....	2	..	2	..	..	..	..	..	
Nyrop[86]	.....	5	..	3	2	..	..	..	..	
Denechau[28]	.....	5	..	3	2	..	..	..	..	
Clairmont[19]	.....	6	2	2	2	..	..	..	..	
Mayer[77]	.....	2	..	2	..	..	..	..	..	
Rubritius[163]	.....	1	..	1	..	..	..	..	..	
		205	116	47	29	9		2	2	
		4								
		201	163 81%		38 19%			4		

Good results with operative mortality considered, 75.6 per cent.

The above tabulation of 977 cases includes only those which have been followed for many months or years and excludes those dying immediately after the operation, those passing out of view, and those dying of intercurrent disease in whom the result of the gastro-enterostomy was still uncertain.

The operative mortality after gastro-enterostomy in the hands of the average surgeon is about 6 per cent. If we include this in our computation in order to learn the late results in all cases of gastric ulcer, exclusive of perforation, operated upon by gastro-enterostomy, we find the following figures: duodenal ulcer, good results, 79.9 per cent.; pyloric ulcer, good results, 76.9 per cent.; ulcer of the body distant from pylorus, good results, 70.9 per cent.; ulcers reported with the site not given, good results, 76.1 per cent.

Fourthly, a gastro-enterostomy added to the closure of a perforation does not always prevent the persistence or the recurrence of gastric symptoms. In one of the cases reported by McWilliams,[73] examination of the patient a year after the

operation disclosed a condition of hyperacidity and the persistence of the same pain and digestive disturbances that the patient experienced prior to the perforation. In another case reported by the same observer, the patient without known cause had one attack similar to those prior to the perforation of a week's duration. In the third case, the result, at the end of a year, was excellent, and the patient could eat anything without difficulty.

In one case reported by Petrén,[102] an anterior gastro-enterostomy with entero-anastomosis had been added to the suture of a perforation. The patient was entirely well 16 months later. In a second case of duodenal perforation to which an anterior gastro-enterostomy had been added, the symptoms recurred within three months, and the patient had been readmitted to the medical ward of the hospital.

In the fifth place patients in whom a gastro-enterostomy is added to the closure of the perforation are quite as susceptible to the possibility of subsequent jejunal ulcer as patients operated on for pyloric stenosis without perforation. Although the writer has found no instance of this complication after gastro-enterostomy in connection with perforation, Patterson, [98] Battle [7] and Percy [100] have collected some 50 cases of this complication after gastro-enterostomy for ulcer.

Before dismissing the subject of the advisability of adding a gastro-enterostomy to the closure of a perforation, it may be stated, after consultation of all accessible published autopsy records, that no fatality has been found which could in any way be ascribed to the omission of that procedure. If such instances are so rare, it would seem to indicate that a gastro-enterostomy must either be entirely omitted at the time of perforation and only done subsequently when indicated by relapsing or persisting symptoms, or, in order to diminish the number of cases in which such a secondary operation would be necessary, it must be left to the judgment of the surgeon to decide in each individual instance whether the added gastro-enterostomy shall be done or not. The writer believes that with satisfactory closure, or after excision and closure

of a perforation, a gastro-enterostomy should be omitted in all cases of perforation of the cardiac end of the stomach, and that in perforation occurring in the pyloric and duodenal zones a gastro-enterostomy should be done only in cases of early perforation when the lesion is of such a character that a gastro-enterostomy would be indicated even although no perforation existed. In other words, that a gastro-enterostomy should be done in cases in which the extent of the cicatricial deformity would probably lead to the persistence or recurrence of gastric symptoms. In all doubtful cases the writer believes that the patient should receive the benefit of the doubt, and that the gastro-enterostomy should be deferred until the effect of the closure of the perforation shall be known. Should the symptoms of ulcer persist or a subsequent recurrence of the ulcer develop, gastro-enterostomy could be done as an operation of choice rather than as one of emergency. Under such conditions its mortality is so slight as to be practically negligible.

The arguments advanced in favor of and against adding gastro-enterostomy to the closure of a perforation indicate a wide difference of opinion as to the efficacy of this measure. This difference of opinion is shared not only by surgeons in widely separated centres but also by those in the same city and even on the staff of the same hospital. Through the great consideration and kindness of a number of prominent surgeons on the continent and in England, who, in their publications, have shown special interest in this subject, as well as through the courtesy of my immediate colleagues on the staff of the Presbyterian Hospital of this city, the writer is enabled to quote directly the present opinion of these experienced men in regard to this important question.

Professor Krogius, of Helsingfors, has added gastro-enterostomy to the suture of a perforation in 14 out of 60 cases during the past ten years, with a total mortality of 50 per cent. He believes that a gastro-enterostomy should be done with a Murphy button in cases in which the pylorus is evidently greatly constricted, and when the condition of the patient will unquestionably stand the prolonged operation.

Professor von Eiselsberg, of Vienna, has not changed his views

published in 1907, at which time he considered a jejunostomy more advantageous than a gastro-enterostomy, especially in facilitating the post-operative nourishment of the patient.

Professor Brentano, of Berlin, has had 22 cases with a mortality of 45 per cent. Since 1902 he has added a posterior gastro-enterostomy to the closure of all perforations within the duodenal and pyloric zones. Of these he has had 16 cases with 11 recoveries. The necessary prolongation of the operation amounts seldom to more than 15 minutes, is comparatively harmless except in "cases in extremis," and is abundantly repaid by the improved conditions of nourishment during convalescence.

Dr. Petrén, of Lund, believes in adding gastro-enterostomy to the closure of a perforation only in cases in which the patient can stand the prolonged operation. The perforation should not have existed for more than 12 to 20 hours, the general condition of the patient should be good, and the heart action but slightly disturbed. Furthermore the pylorus should either be already the site of cicatricial contraction or it should be stenosed by the suture. Under these circumstances gastro-enterostomy probably increases the chances of recovery. Only a minority of those in whom the perforation has been closed without gastro-enterostomy require that operation subsequently.

Professor Noetzel, of Saarbrucken, since the publication of his paper in 1906, has had six additional cases which demonstrated the value of adding gastro-enterostomy to the closure of a perforation in every case, irrespective of its location, and even when the closure of the perforation has not resulted in the constriction of the pylorus, for the reason that: (1) it corrects hyperacidity; (2) it makes recurrence less likely, and although it does not always succeed in preventing a fresh outbreak of the disease, it is the only measure which can be utilized for that purpose with any hope of success. He refers to one of his unpublished cases in which, two years after the excision and suture of a perforating ulcer on the anterior wall of the stomach, the symptoms recurred and on operation by Rehn a large ulcer was found on the posterior wall. Possibly in this case had a gastro-enterostomy been done at the time of the closure of the perforation, recurrence would not have taken place. He also refers to a second unpublished case in which a condition of general peritonitis in the case of a perforation of 72 hours' standing made a speedy termination of the operation and the omission of a gastro-enterostomy imperative. Even the extensively indurated character of the ulcer, covered with fibrinous exudate, rendered an excision in healthy tissue or excision of even the edges of the ulcer impossible. The patient recovered after a suture of the perforation but repeated examinations showed a persistent hyperacidity.

Professor Noetzel also added the notes of a most interesting case in which a perforation had developed in a large ulcer on the lesser curvature, which could be treated only by a circular resection of the middle segment of the stomach according to the method of Riedel and Payr. This was carried out accordingly, the sutures, as Payr has emphasized, being inserted without difficulty. In such a case gastro-enterostomy would not be done. The patient made an excellent recovery.

Résumé: Professor Noetzel believes in adding gastro-enterostomy to the excision and closure of all cases of perforation, except where speed is essential and where the lesion is such as to demand a circular resection.

Professor Schoemaker, of The Hague, advocates gastro-enterostomy even in cases where the pylorus is stenosed only where the condition of the patient will stand the longer operation. In cases of advanced peritonitis, speed is essential and gastro-enterostomy can be added subsequently if needed. Professor Schoemaker has had four successful cases of this character. In perforations remote from the duodenal and pyloric zones, he believes that gastro-enterostomy is useless. In severe cases the perforation is closed as quickly as possible. In other cases the ulcer is first resected.

Professor Martens, of Berlin, advocates gastro-enterostomy only when the pylorus is already the site of constriction or where this results from the closure of the perforation. In other cases he believes a speedy termination of the operation of greater value than an added gastro-enterostomy.

Dr. Kroiss states that both from his former experience in the Innsbruck clinic as well as from his later experience, he is a firm believer in the advantages gained by adding a gastro-enterostomy to the closure of a perforation. He grants, however, the possibility of obtaining satisfactory results after simple suture. He refers to one recent case operated on more than 24 hours after perforation by a colleague, in which all the advantages of the added gastro-enterostomy were clearly demonstrated.

Professor Körte, of Berlin, says that the opinion which he expressed in a paper published on this subject in Langenbeck's Archives (vol. lxxxiii) has been substantiated by further experience, and that he consequently regards a gastro-enterostomy advisable: (*a*) when the perforation is located at the pylorus or its immediate vicinity in such a way that its suture or subsequent cicatricial contraction may lead to pyloric stenosis; (*b*) he also considers that it is indicated in callous perforating ulcer of the lesser curvature which threatens to result in hour-glass stomach; (*c*) it should be done, however, only in patients whose general condition is sufficiently strong to permit of prolonging the operation for 15 minutes; (*d*) after the perforation has existed for 12–16 hours, the patient's general condition is such that a gastro-enterostomy had best not be done.

Mr. Moynihan, of Leeds, writes as follows: "With regard to the performance of gastro-enterostomy in cases of acute perforating ulcer, I reserve this operation for the cases in which the closure of the ulcer causes immediate and considerable obstruction, and those in which it seems likely that, as a final result of the ulceration and of the suture, some degree of obstruction is likely to result. If the ulcer is not causing obstruction, that is, if it is on the lesser curvature or anterior wall toward the cardiac end of the stomach, I do not perform gastro-enterostomy. I have no belief whatever in the so-called 'physiological action' of gastro-

enterostomy. This of course implies that the short-circuiting of an ulcer is called for in all cases of duodenal perforation, and in all cases in which the ulcer which has given way lies within an inch or two of the pylorus on the gastric side.

"The first case in which I performed gastro-enterostomy for a perforating ulcer was that recorded in the *Lancet*, Dec. 14, 1901—see especially page 1662, column 1. I believe it was in that paper that I was the first to advocate this operation."

Dr. W. J. Mayo, of Rochester, writes as follows: "In cases of acute perforation where the patient is in poor condition and there is a spreading peritonitis, we have closed the perforation, establishing pelvic drainage, and set the patient up in bed as a rule without irrigating the abdomen. If the patient is in fair condition, we close the ulcer by sutures and an omental graft and do a gastro-enterostomy. At one time I felt that it was better to do a gastro-enterostomy on every case of this sort, but I am convinced that I lost one case by adding the gastro-enterostomy to closure of the opening on a patient who was in poor condition."

Dr. Peck, of New York, writes as follows: "My feeling at present in regard to gastro-enterostomy at the time of closure of perforation is, that in duodenal ulcers or gastric ulcers near the pylorus where infolding by suture means probable narrowing of the pylorus, it should be done at once if the patient's condition will permit.

"In perforation of the anterior wall at a distance from the pylorus, I believe that it should not be done as a routine procedure, as in many cases it will not be needed. I have had no experience with posterior wall perforations."

The difference of opinion held by my colleagues on the staff of the Presbyterian Hospital are obvious in the following statements:

Dr. Blake believes that a gastro-enterostomy should be done when the closure of a perforation produces appreciable narrowing of the pyloric-duodenal lumen. This stenosis he is rather inclined to accentuate in the closing of the perforation.

Dr. Woolsey is inclined to do a gastro-enterostomy in duodenal perforations and in those near enough the pylorus to produce more or less stenosis.

Dr. Hawkes believes that a gastro-enterostomy is unnecessary in closure of perforations either with or without excision, unless the measure adopted causes undue constriction.

Dr. McWilliams believes that a gastro-enterostomy should be done in the cases which would stand the operation (those operated on within a few hours of the perforation). In these cases the perforation should be closed by suture which would infold the ulcerated area to the extent of practically closing its lumen. A gastro-enterostomy by suture should be done with a large stoma, at least two inches. This gives the best guarantee against the recurrence of the perforation as well as a prevention of subsequent gastric symptoms from contraction of the ulcer. This will cause very little increase in the mortality. Those perforations with marked peritonitis should not be subjected to the added strain of a gastro-enterostomy.

Dr. Hartwell believes that gastro-enterostomy is necessary if the pylorus shows a palpable narrowing with dilatation of the stomach. If the stomach is not dilated and the pylorus is not constricted, gastro-enterostomy might be omitted, but these cases are few.

The statement should be added that the members of the hospital staff were unanimous in advising a gastro-enterostomy where the suture of the perforation resulted in extensive contraction of the pylorus or duodenum, and also that a gastro-enterostomy should be omitted in all patients in whom peritonitis was advanced.

That such widely different opinions should be expressed by men of equal skill is accounted for in part, at least, by the fact that it is impossible to estimate the comparative mortality in cases treated by suture only and in those in which a gastro-enterostomy is added to the closure of the perforation. It is self-evident, if one considers the marked differences in the patients' ages, in their general condition, especially in the condition of the circulatory apparatus and the kidneys, in the virulence of the infection, in the rapidity with which the gastro-duodenal contents escape into the general peritoneal cavity, and in the duration of the perforation, that all comparison is futile. The only other sound basis of comparison, that based upon the character of the final result, is of greater although still of uncertain value. Of the final result in cases treated by suture with gastro-enterostomy, the evidence is meagre, probably owing to the fact that this method of treatment has been in general use only during the past few years.

The following cases showing final results after this procedure have been reported in the literature:

CASE 1.—MUSSER and KEEN:[20] At the time of publication, about one and a half years after the suture of a pyloric perforation with gastro-enterostomy with Murphy button, patient still suffered from the effects of the retention of the button in the stomach.

CASE 2.—BRAUN:[21] Patient completely well three and one-half years after the closure of a perforation in the anterior wall of the stomach by an omental flap only. Owing to the friability of the stomach wall an anterior gastro-enterostomy was done.

CASE 3.—BLAKE:[22] Patient completely well two years after the closure of an indurated pyloric ulcer by suture plus posterior gastro-enterostomy. The patient had previously had "stomach trouble" of moderate severity extending over a considerable number of years.

CASES 4, 5, and 6.—STEINTHAL:[108] In these cases, the fact is mentioned that the ultimate result was excellent without further detail.

CASES 7 and 8.—PATTERSON:[96] Patients well 15 and 24 months, respectively, after the closure of a perforation with gastro-enterostomy. No further detail given.

CASE 9.—NOETZEL:[94] Two and one-half years after excision, suture, superposition of an omental flap, and a posterior gastro-enterostomy, patient's general health was excellent.

For the post-operative histories of the three following cases, I am greatly indebted to Dr. McWilliams. The cases were reported in the ANNALS OF SURGERY, vol. liii, p. 144, and the following is a report of their condition one year later:

CASE 10.—Perforation near lesser curvature and pylorus with induration. Closed by Lembert and two tiers of sutures. This patient remained well until the past week (20 months after the operation). During the past week he has suffered from constipation and three or four attacks of vomiting several hours after eating. The stomach has been sour and the tongue slightly coated. The symptoms may be due to a hernia in the scar.

CASE 11.—Twenty months ago patient J. S. was operated on by suture and posterior gastro-enterostomy for a pyloric perforation. One year after operation patient had an empyema of unknown cause. Two weeks ago patient had an attack of epigastric pain similar to that which the operation had relieved. At present he is completely well.

CASE 12.—H., 28. Patient had had from childhood almost continuous knife-like pain with vomiting, most marked at night and on lying down. Three years before the operation for the perforation the appendix was removed in another hospital without relieving the symptoms. The diagnosis of gall-stones was then made. The attack of the perforation resembled other previous attacks that had been diagnosed as gall-stone colic. At this time operation (McWilliams) disclosed a perforation in the centre of an indurated ulcer the size of an egg just to the cardiac side of the pylorus. It was closed by Lembert sutures in tiers together with a posterior gastro-enterostomy by suture.

Post-operative: For six months after the operation patient was relieved but not cured, the pain and vomiting continuing although with diminished severity. About six months after the closure of the perforation, the patient was operated on for epigastric hernia. Inspection of the stomach showed no sign of the old ulcer and a patent pylorus. Since this operation for hernia the pain has been worse than prior to the operation for perforation, and the vomiting has been just as frequent and persistent. Although patient vomits once or twice daily three or four hours after eating, there has been no loss of weight. Tongue slightly coated but clear at the tip. Occasional sour taste in the mouth. Stomach analyses by Dr. H. S. Carter show at present a marked hyperacidity.

Through the courtesy of my colleague, Dr. Blake, the history of the following case is added:

CASE 13.—J. S., male, 31. Admitted to the Presbyterian Hospital December, 1909. Patient has complained of moderate stomach trouble for years. This has consisted chiefly of epigastric pain, occurring several hours after eating and relieved by the further taking of food.

The present attack of severe epigastric pain is of three hours' duration. Immediate operation. After examination of the appendix through an intermuscular incision, the pylorus was exposed and a perforation in the centre of an indurated pyloric ulcer was found. This was closed by Lembert suture and a posterior gastro-enterostomy was added. The abdomen was closed without drainage. There was no vomiting nor indigestion during convalescence.

It is now two years since the operation, and the patient has had no stomach trouble of any kind whatever.

Of the character of the end results after suture only, the evidence is of greater value in that not only are the cases more numerous but the period of observation has extended over a longer time. An analysis of these cases appears to show that in a very considerable proportion the patient is either much improved or permanently cured. The writer, in his previous paper,[30] reported 53 instances collected from the literature and from his own experience, in which for periods of from one to six years the patients had been completely free from all gastric symptoms, and to this number should now be added a summary of the end results reported by Dahlgren,[24] Morton,[90] and Petrén,[102] and others.

DAHLGREN [24] reports well 7 years after the operation, 2 cases; 5 years after, 1 case; 4 years after, 1 case; 2 years after, 3 cases; 3 months after, 1 case; 2 cases, in which symptoms persist.

MORTON [90] reports well 3 years after the operation, 3 cases; 2 years after, 2 cases; 1 year after, 1 case; 1 case, in which symptoms persist.

PETRÉN [102] reports well 6 years after the operation, 1 case; 5 years after, 2 cases; 4 years after, 1 case; 3 years after, 2 cases; 2 years after and 1 year after, of each 3 cases; less than a year, 2 cases. Of 28 cases, 15 were without symptoms; 8 had slight or occasional symptoms, and 5 had severe symptoms. This author calls attention to the fact that cases in which the perforation has occurred without warning are more likely to be permanently relieved than those in whom there has been a persistent gastric history for some years. It is also worthy of mention that, in his experience, perforations of ulcers at or near the lesser

curvature are more likely to be followed by persistent symptoms than those at or near the pylorus.

JOPSON [58] reports one patient who, three years after the closure of a perforation by suture, was perfectly well with the exception of occasional attacks of fermentation.

HESSERT [101] reports a patient well 18 months after the simple closure of a perforation.

MCWILLIAMS [73] reports a patient well four and one-half years after the simple suture of a perforation. Two years after the operation he had one attack of indigestion.

Through the kindness of Dr. Peck, his valuable end results in cases previously reported by him and cited by the writer in his former paper [99] are herewith appended:

CASE 1 (25 in former paper).—Not traced further.

CASE 2 (26 in former paper).—Well four years after operation. Then lost sight of.

CASE 3 (27 in former paper).—Well four years after operation.

CASE 5 (28 in former paper).—Patient has occasional gastric distress after indulgence in alcohol. Otherwise well four years after operation.

CASE 7 (29 in former paper).—Patient had an ulcer in the middle of the anterior wall. Occasional pain and indigestion persisted. In January, 1911, four years after the closure of the perforation, Dr. Peck exposed the stomach which had become an hour-glass one, and relieved the patient by doing a gastro-enterostomy. The patient has been perfectly well since.

CASE 8.—In 1907 suture of duodenal perforation. One year later a second perforation occurred at the same point. This was also sutured. Fourteen days later a gastro-enterostomy was done for symptoms of pyloric stenosis. Death occurred several days later, and an autopsy showed a beginning carcinoma in the old duodenal ulcer.

A résumé of the final results operated on by the writer follows:

CASE I (reported in previous paper).—Perforation on the anterior wall of the stomach midway between the cardia and pylorus. Suture only. Patient well at the end of four years when she passed out of view.

CASE II (reported in previous paper).—Pyloric ulcer closed by suture. Patient completely well eight years after operation.

CASE III (reported in previous paper. See also secondary gastro-enterostomy after primary suture of perforation).—Patient well for three and one-half years after operation for perforation on anterior surface of first part of duodenum. Then symptoms of ulcer recurred, and two years later gastro-enteros-

tomy was done in Germany. Patient has been completely well since this last operation.

CASE IV (reported in previous paper).—Perforation on anterior wall of first part of duodenum. Patient entirely well for two and one-half years, when ulcer symptoms recurred, and he suffered from two attacks of pain. Efforts to trace him latterly have failed.

CASE V (reported in previous paper).—Perforation on the anterior wall of the stomach two inches from the pylorus near the lesser curvature. Suture. This patient made an excellent recovery but was soon lost sight of.

CASE VI (reported in previous paper).—Perforation at junction of pylorus and duodenum closed by suture. Recovery. Patient cannot be traced.

CASE VII (reported in previous paper).—Perforation on the anterior surface of the first part of the duodenum closed by suture. Patient completely well five years after the operation.

CASE VIII (reported in previous paper).—Perforation on the anterior surface of the first part of the duodenum closed by suture. Patient had advanced atheroma at the time of operation, and one year after died from intercurrent disease.

CASE IX (reported in previous paper).—Perforation on the anterior wall of the second part of the duodenum closed by suture four days after the onset. Patient died four days after the operation.

CASE X (not previously reported).—Male, aged fifty-two. Admitted to the Presbyterian Hospital, January 26, 1910.

Patient has always been well. There was a history of the excessive use of tobacco and the moderate use of alcohol. On January 16, there was epigastric discomfort especially on the right side, which soon became associated with eating but did not interfere with the patient's work (laborer). The pain was localized, of knife-like character. It lasted for about 20 to 30 minutes after eating, and was bad enough to make the patient diminish the amount of food he ate. Early on the morning of admission, as patient was leaving work (night laborer), the pain became very severe. He walked with difficulty to the trolley, and on reaching home he walked up several flights of stairs. The pain was so severe that he was brought to the hospital in an ambulance.

Physical Examination.—The tongue was markedly coated. There had been neither nausea nor vomiting at any time since

the onset. The epigastric region was retracted, and the entire abdomen moved very slightly with respiration. There was general board-like rigidity, most marked in the upper right quadrant. The upper segment of the right costal arch was also rigid, and pressure on this point as well as in the epigastric region to the right of the median line was painful. There was dulness in the right flank as far forward as the edge of the rectus muscle. The pulse was only 48 and strong. There was no rise of temperature, and respiration was only slightly quickened. There was a general leucocytosis of 13,000 and a polymorphonuclear count of 93 per cent. Three days later these had diminished to 5000 and 60 per cent. respectively.

Immediate operation eight hours after the perforation. Under gas and ether anæsthesia, the abdomen was opened through an upper right pararectal incision. A small amount of gas escaped, and a considerable yellow exudate which filled the right loin and the right lumbar gutter as far as the appendix. It did not extend into the pelvis. After removal of the exudate, examination showed an induration in the end of the first part of the duodenum, anterior surface, with a small punched-out hole in its centre. This was closed with a purse-string suture reinforced by two Lembert sutures, and after irrigation of the right lumbar gutter and the corresponding subphrenic space, into which a cigarette drain was introduced, the abdominal incision was closed in the usual way.

The recovery was without incident. At no time was the pulse over 80. Cultures taken from the exudate near the perforation showed no growth.

Present Condition:—Two years after the operation, the patient is free from all gastric symptoms.

Case XI (not previously reported).—Male, S. J., aged thirty. Admitted to the Presbyterian Hospital June 20, 1910.

There was a history of the excessive use of tobacco, coffee, and tea. Moderate use of beer. No previous gastric history. On afternoon of admission, while working, patient was seized with a violent pain in the right hypogastrium. Patient vomited once after a glass of brandy taken in order to relieve the pain. Brought to the hospital in the ambulance.

Physical Examination.—The respiratory movement of the abdominal wall was restricted. There was general rigidity, especially in the right upper quadrant. The rigidity was least marked

in the flanks. There was bilateral costal resistance, especially in the upper right segment. The left side of the abdomen was tympanitic. The right side on auscultatory percussion showed an area of dulness extending from the margin of the rectus into the loin. The tympany in the right flank was higher pitched than on the left side. There was marked tenderness on pressure opposite the navel.

Chloroform followed by ether, four hours after the perforation. Right upper pararectal incision. There was free yellow fluid without gas in the right upper quadrant, not sufficiently abundant to have extended down the right lumbar gutter or into the pelvis, but limited to that part of the peritoneal cavity above the level of the transverse colon. There was a perforation the size of a buckshot in the upper anterior portion of the first part of the duodenum without discoverable induration. This was closed with a purse-string suture reinforced by two Lemberts, and the abdomen closed after local irrigation of the upper right portion of the peritoneal cavity. A small cigarette drain was introduced into the right subphrenic space and the abdomen closed in the usual manner.

The patient made an excellent recovery but could not be traced three months after leaving the hospital.

CASE XII (not previously reported).—Male, aged forty-four. Admitted to the Presbyterian Hospital March, 1911.

There was a history of the moderate use of alcohol and tobacco. For the past year patient has been subject to mild attacks of pain occurring from two to four hours after eating, which were relieved by further eating and by bending forward. One year ago during an attack of one week's duration there were several attacks of vomiting. During the entire year, however, he has complained of indigestion with vague sensations of pain and oppression in the epigastrium, sometimes radiating to both shoulder-blades. He has also suffered from gaseous eructations and occasionally vomited a greenish fluid.

On the day prior to his admission he had a sudden attack of pain, severe and colicky, in the epigastric region; this radiated to the left and was persistent. There was no history of vomiting. The bowels had not moved for 48 hours and two enemas had been given without result. Upon admission the abdomen was found moderately distended; it was very rigid, especially in the right upper quadrant, with generalized tenderness and tympany except

in the right flank, where dulness as far forward as the edge of the rectus was elicited. A rectal examination was negative, revealing no tenderness. The patient's temperature was 99.5°; pulse, 116; respirations, 24. A blood count showed 7000 white blood-cells with 87 per cent. polymorphonuclears. The urine contained a heavy trace of albumin and casts. The patient was seen in consultation by Dr. Harold of Macon, Ga., who made the correct diagnosis.

Operation 36 hours after perforation. Under ether anæsthesia, the abdomen was opened through a right upper pararectal incision. This incision was subsequently enlarged by a transverse incision extending from its upper part toward the median line. There was an immediate gush of a large quantity of turbid, dark-colored fluid, containing gastric and duodenal contents, which completely filled both subdiaphragmatic spaces as well as the space between the left lobe of the liver and the anterior abdominal wall. The right lower half of the abdomen and the pelvis were also filled with fluid of the same character. The fluid was thicker, more grumous, and more offensive about the pyloroduodenal junction than at more distant points. A perforation in an indurated ulcer of the size of a 25-cent piece was found in the anterior upper wall of the duodenum just beyond the pylorus. It was closed by a purse-string suture reinforced by two Lembert sutures. The peritoneal cavity was cleansed by general irrigation, and cigarette drains were introduced into either subdiaphragmatic space above and through a counteropening above the symphysis into the pelvis below. The abdominal incision was then rapidly closed in the usual manner.

Post-operative.—The patient made an excellent recovery from the anæsthetic. On the day after the operation his pulse was less than 100 and there was no nausea or vomiting. Fluids by mouth were given from the fifteenth hour. For a week the drainage was satisfactory. The discharge from the suprapubic opening was serous, and after the drain was removed on the fifth day the sinus rapidly closed. The discharge from the upper opening was offensive and purulent, and some of the sutures giving way the wound healed slowly by granulation. At the end of ten days the temperature chart and blood counts indicated pus retention, and as the patient's condition did not warrant posterior drainage through the pleura, the device of attaching siphon drainage to a catheter introduced into either subdiaphragmatic space was adopted with

excellent results. The sinuses ultimately closed, the one between the left lobe of the liver and the anterior abdominal wall, which was the least deep, was the last to heal. Three months after the closure of the perforation a stomach analysis showed no hyperacidity. Nine months after the operation a second gastric analysis showed a moderate hyperacidity. In all other respects, however, the patient is perfectly well.

CASE XIII (not previously reported).—Female, aged twenty. Referred to me by Dr. H. R. Charlton of Bronxville, to whom I am greatly indebted for the subsequent post-operative history.

For the past two years she had been treated by various medical men for an "acid stomach," receiving a large amount of alkalies for its relief. Eighteen months ago pain was added to her difficulties, especially severe after taking food. There was no vomiting and only slight constipation. One month before operation patient developed tenderness in the epigastric region, which increased to such an extent that the pressure of the clothing could be tolerated for short periods only. Shortly after consulting Dr. Charlton for the first time, patient took a half ounce of castor-oil and five hours later while sewing she had a sudden severe knife-like pain in the epigastrium with a feeling of faintness and vomiting. On examination there was restricted abdominal respiration, general rigidity most marked above the level of the navel and slightly to the right of the median line, moderate tenderness, no temperature, and a pulse of 100.

Operation at the Lawrence Hospital in Bronxville 18 hours after perforation. The rigidity being most intense just prior to the operation over the region of the appendix, an intermuscular incision was first made and the appendix was inspected. On opening the abdomen there escaped the characteristic fluid as frequently seen in connection with pyloric perforations, which abundantly filled the entire pelvis and the right lumbar gutter. The pylorus was then exposed by the usual upper right pararectal incision, and a perforation the size of a millet-seed found close to the junction on its anterior surface. This was rapidly closed with a purse-string suture, strengthened with two Lemberts, and the right subphrenic space and pelvis carefully cleansed by saline irrigation. The abdomen was then closed, cigarette drains being first introduced into the right subphrenic space and pelvis through the intermuscular incision.

The patient recovered well from the anæsthetic and for the

first week did very well. There was practically no vomiting, and the patient took her nourishment without difficulty. After that time patient developed a left pleurisy with effusion, a patch of pulmonary gangrene, a left-sided pelvic abscess, and multiple abscesses in the subcutaneous tissue. These different post-operative complications were all successfully weathered, however, and now, six months after the operation, Dr. Charlton tells me that the patient is eating well and gaining weight rapidly, and is able to attend to the customary household duties.

CASE XIV.—G. R., admitted to the Presbyterian Hospital March, 1910.

Three years ago patient had dull epigastric pain which was cured by lavage. In March and May, 1909, patient had similar attacks, which were relieved in the same way. In August patient was operated on at the New York Hospital for acute perforation of the pyloric-duodenal junction by Dr. Bolton. The perforation was closed by a purse-string suture reinforced by Lemberts and the superposition of an omental flap. The patient remained entirely well until two weeks ago (seven months after the operation), when the gastric symptoms recurred and vomiting, which was persistent, developed.

On physical examination the greater curvature of the stomach reached to the umbilicus and test-meals showed both gastric stasis and a lack of digestion. Further analysis showed a total acidity of 0.3 per cent., with hydrochloric acid 0.27 per cent., and no lactic acid.

Chloroform. The abdomen was opened through a median incision above the navel. The stomach was moderately enlarged. To the vicinity of the pylorus the omentum was attached, and had formed dense adhesions which were not disturbed. Through these adhesions the first part of the duodenum felt as if considerably thickened with cicatricial tissue. A typical posterior gastro-enterostomy was done, which completely relieved the patient. Twenty months after the operation the patient had had no relapse.

In conclusion, the writer wishes to emphasize the importance of publishing complete reports of both the primary and final results of all cases of perforation, irrespective of the form of treatment. It is only by a study of such frank and accurate records that the real value of the different methods of treatment of this very important lesion can be determined.

The writer also takes this opportunity to thank most sincerely Professors Körte, Krogius, Noetzel, Brentano, von Eiselsberg, Schoemaker, Martens, and Drs. Petrén and Kross, together with Mr. Moynihan of Leeds, and Drs. Mayo, Peck, and McWilliams, for their kind and valuable assistance in the preparation of this paper.

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INTESTINAL OBSTRUCTION DUE TO GALL-STONES.*

WITH REPORT OF THREE SUCCESSFUL CASES.

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THE chief purpose of this communication is to present for record three successful gall-stone ileus cases that have come under my personal observation. In all three cases the condition was serious, as the obstruction had existed until they were in a most perilous and hazardous way, and nothing but the timely aid of surgery would have been of avail. There is such an abundance of literature on this subject that, at first sight, it might seem to be a somewhat common ailment. Such, however, is not the case, as numerous statistics show. It is reported (Edward[1]) that up to 1910 there had been but 250 recorded cases. Bradbury[2] states that from 1893 to 1896, in the Rochester Royal Infirmary, there occurred but one case of this kind from a list of 50,000 patients treated. The rarity of this interesting complication of the surgery of the biliary tract, together with the unique and complex findings in my last case, have been the chief incentive that has induced me to present these cases.

CASE I.—*Gall-stone ileus, complete; operation, October 12, 1906. Recovery.*

Mrs. T. W., married, aged fifty-nine. I was called by Dr. W. W. Cissel to see this patient who was ill with an acute abdominal malady, the diagnosis of which was uncertain. The patient was a stout woman with a large abdomen; her symptoms were more or less continuous pain, constant vomiting which had recently become stercoraceous, associated with inability to have

* Read before the Southern Surgical and Gynecological Association, Dec. 13, 1911.

the bowels moved. Previous history obtained was that she had had numerous bilious attacks, which had occurred during the last twenty years. Of late these attacks had been fewer in number and less severe in character. Present illness began September 30, with acute abdominal pain and vomiting. The vomiting continued until October 3, when there was a slight let-up, but she was still nauseated and could take no nourishment. She was up and about, although complaining. On October 7 she had another attack, vomiting ugly green material, and she went to bed. The vomiting persisted more or less continuously from this time. This and the inability to have the bowels moved were the chief symptoms. The vomiting finally took on a stercoraceous character, and abdominal soreness and pain increased. There had been a slight rise in temperature, but this had subsided when I saw her. I could make out no definite evidence of appendicitis; there was some muscle stiffening; no evidence of visible intestinal coils; no definite localized mass; some slight tenderness over the gall-bladder, but nothing to make one think of cholecystitis. She was much flushed in the face; pulse was not rapid but weak; and she showed evidence of marked general weakness, due to lack of nourishment, which she had been unable to take practically since September 30. No definite diagnosis could be made other than possible intestinal obstruction from some cause, the symptoms of intestinal obstruction being present, namely, persistent colicky pain, persistent vomiting, and coprostasis. I am free to confess that gall-stone ileus did not enter my mind, as I had never seen a case. The chief point was that she needed immediate help, and this was given by laparotomy.

Operation.—The abdomen was opened through a right rectus incision above the umbilicus, the incision placed here because I thought that the trouble could probably be located in the upper or middle abdomen. When the peritoneum was opened, a lot of fluid, slightly tinged with blood, came out. The small intestines were deeply congested and ballooned, so that it was evident she had an obstruction from some cause. A hand was placed in the region of the gall-bladder, but nothing could be made out there, and the appendix was normal. Passing the hand over toward the mid-line, a mass was felt in the small intestine, which at first conveyed the impression of being a carcinoma of the small intestine. Pulling it into the wound, I found it was an ob-

structed small intestine, the point of obstruction being about five feet from the ileocæcal valve. The loops of small intestine proximal to the blocking were enormously distended, and the loops distal to this point were markedly collapsed and tape-like. It was seen that the obstruction was due to a foreign body, which was tightly impacted in the lumen of the intestine, completely obstructing it. It was so hard and rigid that no impression could be made upon it; I tried several times to force it from its lodgement, but the blunt end of the stone was forward, and it had some rough spicules, as will be seen from the specimen. My idea was to push it into the large intestine, but this was impossible. After the bowel was tucked off with gauze, a longitudinal incision was made and the stone delivered. Although there was deep congestion of the upper bowel proximal to the obstruction, at the point of impaction the bowel wall was in a recoverable condition. The proximal loop was not emptied, but the current was arrested by gauze being tied around the loop until the stone was removed. The opening was then closed by a continuous Connell suture, with Lembert sutures over it, and there was no diminution of the lumen at this point. Following the closure, the fecal current was then allowed to pass on, and it was seen to go from the ballooned to the collapsed portion, showing that the obstruction was entirely removed. A protective drain was put down to the point of incision in the bowel, and the abdomen closed around it. This was done for fear there would be leakage, and also because there was much peritoneal fluid present.

The patient was considerably shocked, due to her exhausted condition, and normal salt solution was given her. She reacted well and made an uninterrupted recovery. The vomiting ceased immediately after the obstruction had been removed. A recent report from her doctor states that she is enjoying excellent health, and has had no further gall-stone or obstructive symptoms.

I am unable to say, in this case, where the portal of entry from the gall-bladder to the intestine was, but from the size of the stone I should judge it to be through a gall-bladder-duodenal fistula.

CASE II.—*Gall-stone ileus, complete; operation, December 11, 1909. Recovery.*

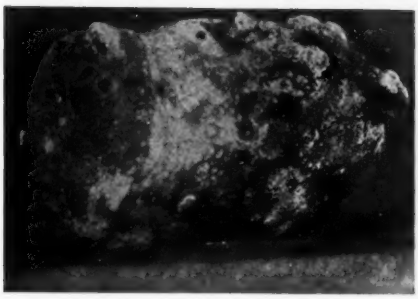
Mrs. B., aged sixty-two; referred to me by Dr. H. M. Slade

She was a stout woman with a very large abdomen. Past history: Apart from vague symptoms referable to the upper abdomen, there were no definite symptoms pointing to gall-bladder disease. Present illness: She came under my care December 9, with a history of having had definite symptoms of intestinal obstruction for ten days or two weeks, the symptoms abating only to recur. The vomiting, pain, and inability to have the bowels moved would subside and then come on again. The family were very loathe to have anything done, and postponed any operative procedure as only a *dernier resort*. When examined by me the cardinal symptoms of obstruction were noted, namely, pain and vomiting, tympany, and arrest of bowel contents. Abdominal palpation revealed nothing specific. There was no definite point of tenderness, and no marked stiffening of the belly wall. A diagnosis of obstruction without giving the cause was made, and I operated December 11.

Ether was given; a low right rectus incision made. Distended, congested small intestines bulged out into the wound, and a lot of dark, turbulent, slightly bloody fluid came out of the peritoneal cavity. A search through the abdomen was made for the point of obstruction, and as the hand passed down into the abdomen, a hard mass was felt in the small intestine—so hard and rigidly held in the bowel wall that I at first thought of an annular carcinoma of the bowel. When the loop of intestine was gotten up, it was seen to be due to a foreign body, tightly impacted, and completely blocking the lumen of the bowel. The point of blockage was in the lower ileum, about six or eight inches from the ileocæcal valve. It was impossible to budge the stone from its position, and pushing it on was out of the question. The bowel was well packed off, and a linear incision, just opposite the mesenteric border, was made and the stone removed. There was some escape of bowel contents, and soiling of the peritoneum in consequence, and there was considerable dark bloody fluid in the pelvis, so it was decided to put in drainage. Two cigarette rubber tissue drains were inserted, and the wound closed around them. The patient was placed in Fowler's position, and normal salt solution given. Vomiting ceased, the pain abated, and she made an uninterrupted recovery.

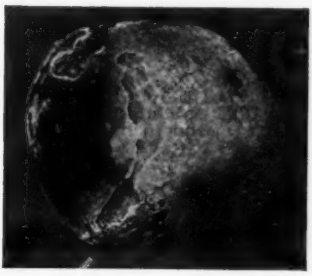
CASE III.—*Gall-stone ileus (strangulation) associated with an ulcerating process which produced an anastomosis between the*

FIG. 1.



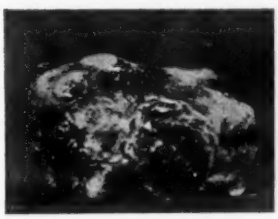
Gall-stone causing intestinal obstruction (Case I).
Operation, Oct. 12, 1906. Recovery.

FIG. 2.



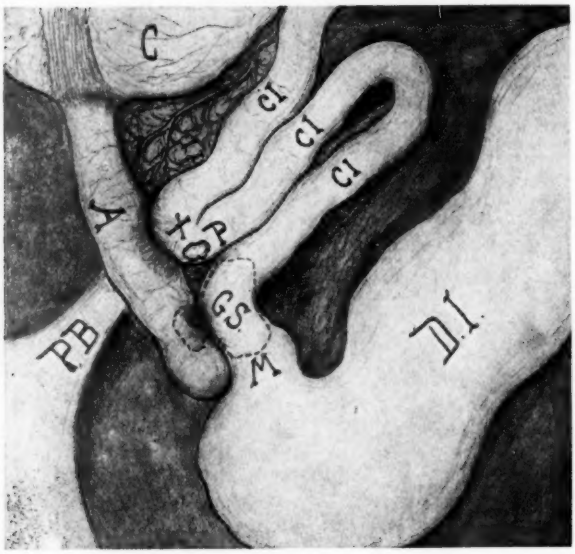
Gall-stone removed in Case II, gall-stone ileus.
Operation, Dec. 11, 1909. Recovery.

FIG. 3.



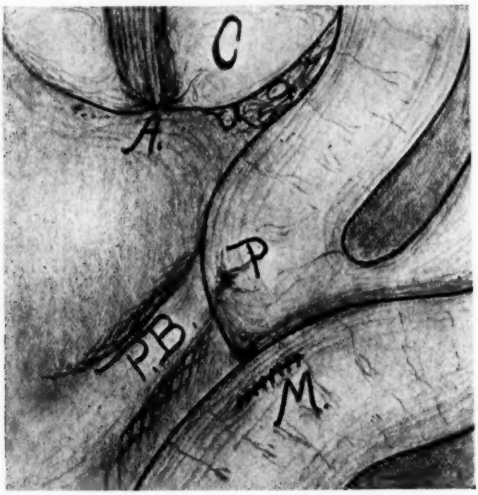
Gall-stone removed in Case III, gall-stone ileus with strangulation.
Operation, Oct. 7, 1911. Recovery.

FIG. 4.



This illustrates diagrammatically Case III, gall-stone ileus with strangulation. *C*, cæcum; *A*, appendix; *CI*, collapsed ileum; *DI*, distended ileum; *PB*, pelvic brim; *X*, ileum kinked and adherent at point of obstruction, *M*, and partially separated to show perforation, *P*; *M*, point of obstruction, appendix and ileum perforated by gall-stone, *GS*

FIG. 5.



The condition after the stone was removed and the anastomosis closed, and the appendix taken away. *C*, cæcum; *A*, appendix removed; *P.B.*, pelvic brim; *P*, perforation at *P* closed; *M*, perforation at point of obstruction closed.

lower ileum and the bulbous appendix, with the third loop of the ileum caught over the mass by a localized peritonitis, and the second anastomosis found in this loop of ileum. Operation October 7, 1911. Recovery.

Mr. S. M., married, aged thirty-six, farmer. There is nothing in the past history that bears upon the present condition. Present illness began October 2, 1911, with severe vomiting; this became expulsive in character and later stercoraceous. Abdominal pain, which was a pronounced symptom, was controlled by morphia, which was given by the doctor. Bowels did not move from Monday until Friday, when there was a slight movement, resulting from high enema. He was brought to Baltimore on Friday, and was first seen by Dr. H. B. Thomas. He was given castor oil and an enema, but these were not effectual; his vomiting was still voluminous and markedly stercoraceous, and, as the intestinal patterns became apparent, I was called in. The clinical picture was that of a pronounced mechanical intestinal obstruction. The man was exhausted from persistent vomiting; he had a small pulse, not very rapid; no temperature; and the facial expression was that of pronounced exhaustion. The abdomen was markedly ballooned; and in the upper abdomen visible coils of intestine were noted. At the time that I saw him peristalsis was visible in these patterns. He was a slender man, with thin abdominal walls, and this was easily seen. A diagnosis of advanced obstruction was made, and he was sent to the Union Protestant Infirmary.

Operation.—This was performed within an hour after I first saw him. Low right rectus incision made; greatly distended and congested loops of small intestine came into view, and a quantity of murky, bloody serum welled out. The ballooned intestines were packed off (in order to keep the intestines within the abdomen, as evisceration of the intestines adds so largely to the element of shock); the cæcum was found to be collapsed, as was the ileum in the immediate neighborhood of the ileocæcal valve. A hand was passed down in the iliac region, and a hard (stone-like) mass was palpated. It was about the size of a small apple, and adherent below the brim of the pelvis, just over a little to the outer side of the right iliac vessels. This mass consisted of coils of small intestines tied together by adhesions, due to local peritonitis, with a hard mass in the lower ileum, which proved

later to be a gall-stone. This was the point of obstruction, as likewise the point of strangulation, in the segment of bowel distal to the point of blockage. The small intestines proximal to this point were greatly distended and congested, while distal to the point they were collapsed. On separating adhesions a loop of ileum, about six inches from the ileocæcal valve, was freed, and an opening was noted in it (as shown by Fig. 4). This communicated with the centre of the mass by an anastomosis. The opening in this first loop was closed with purse-string sutures of fine silk, and the loop tucked aside. In continuing the separation of the adhesions, over and around the mass, a large anastomotic opening was found between apparent adjacent coils of ileum. In this anastomosis was found a large gall-stone, lying partly within the ileum and partly within what proved later to be a bulbous appendix. This point of blockage was 18 or 20 inches from the ileocæcal valve. An ulceration had occurred, making this opening between the ileum and the appendix, and a local peritonitis had caught this above mentioned third loop, perforating it. In consequence of this inflammatory process angulation took place, and complete strangulation of the bowel at the point distal to the blocking occurred. The appendix was gotten up and removed. The opening in the ileum could not be attended to while it was tied to the side of the pelvis by dense adhesions and so deeply placed. By freeing the adhesions, the loop was gotten up, and the strangulated segment freed (it appeared as though constricted by a tight band). The opening, which was over an inch long, was closed with a running suture, and a few interrupted Lembert sutures were placed over this, thus completing the closure. The lumen of the bowel was not diminished at this point. Some contamination occurred before this opening could be closed. The zone of strangulated bowels seemed to be sufficiently viable not to interfere. After releasing the strangulation and closing the opening, the lumen seemed to be re-established, as noted by the contents of the ballooned portion passing into the collapsed portion. In view of the contamination, pelvic drainage was deemed expedient, and a rubber tube, the size of my little finger, was placed in the pelvis, along with several iodoform rubber tissue tucks. The abdomen was closed except at the lower angle, where the drainage came out. The

patient was somewhat shocked; 700 c.c. of salt solution was given under the breast during the operation.

After History.—The vomiting stopped at once, and the following morning his condition was favorable—pulse 80, normal temperature, and draining well. In order to overcome the toxæmia, which was the chief feature in the case, he was given continuous salt solution, placed in the Fowler position, and nothing allowed by mouth for thirty-six hours. He made an uneventful and uninterrupted recovery.

History.—Gall-stone ileus, although rare in its occurrence, is an old subject. Bartholin,[3] in 1654, published a case of perforation of a gall-stone from the gall-bladder into the jejunum. Many interesting cases have been reported since that time. Murphy,[4] in a recent article, divides the subject into two distinct periods—first, that which precedes the appearance of the epoch-making article of Courvoisier in 1890, and second, from 1890 to the present time. In the first period gall-stone ileus was distinctly in its infancy, but since 1890 it has been purely within the border-line of surgery. Courvoisier justly deserves credit for having directed surgical endeavor in the proper channels. His work was indeed a masterful production. The forcible way in which he presented pathological problems having to do with gall-stone disease in its various locations gave him world-wide recognition. He is credited with having done the first successful pioneer work in common-duct stones, having performed three successive, successful operations in 1890. His book, with its voluminous statistics, has been quoted more generally than any other; but I think he is probably best known by the law which is given his name—Courvoisier's[5] law. The law briefly stated is as follows: "When the common duct is obstructed by a stone, dilatation of the gall-bladder is rare; when the common duct is obstructed by other causes dilatation of the gall-bladder is common."

The truth of this law is far-reaching, and it is one of the most certain in surgery. Its chief value lies in that it dis-

tinguishes the curable from the incurable, the operable from the inoperable, the lithogenous from the non-lithogenous cases. Cabot,[6] in 1901, called attention to the wide-spread neglect of it; and stated that it was curious indeed that a law of such value should have been so slow in penetrating the minds of American physicians and surgeons. This was shown by the fact that most American writers on medical and surgical aspects of disease of the gall-bladder either made no reference to the facts emphasized by Courvoisier, or made statements directly contradictory to that which had found general acceptance in England and on the Continent.

The monumental works of Langenbuch, along with Naunyn, Kuemmel, Riedel, Kocher, Fenger, Mayo Robson, and Treves, have added so much of value that they must not be overlooked.

Frequency of Occurrence.—This form of obstruction, as compared with other causes, varies markedly according to the statistics given by the various authors: 1 to 15 (Fitz); 1 to 28 (Lichtenstern); 1 to 17 (Gibson). Mayo Robson[7] states that in the four largest hospitals in the United Kingdom, for a period of twelve months, in the 80,000 in-patients and several hundred thousand out-patients, there were but four cases of intestinal obstruction due to gall-stones. Records of the Johns Hopkins Hospital, together with the Union Protestant Infirmary and St. Agnes, show that out of a total of 280 cases of obstruction, there was found but one due to this cause (Bloodgood[8]). Barnard[9] reports a series of eight cases from the records of the London Hospital, covering a period of eight years. These were selected from 360 cases of intestinal obstruction from various causes, making the frequency of gall-stone obstruction in this series of cases 1 to 45. Of the eight cases, three recovered and five died. An interesting fact is that in four of the fatal cases the post-mortem showed a gall-bladder-duodenal fistula between the neck of the gall-bladder and the first part of the duodenum, explaining the portal of entry of the calculus into the intestine.

In view of the varying statistics, I have endeavored to

get further data regarding the frequency of the occurrence of cholelithic obstruction. I received personal communications from a given number of prominent surgeons, selected at random, and from the 28 heard from, I was able to collect but 16 cases. These surgeons are men who have had long and active careers, and their cases are to be numbered in the thousands. It would be safe to say that each of these 28 men would number a thousand operations a year, and doubtless their experience covers at least 20 years; so that, grossly speaking, from the number of 540,000 cases there occurred 16 cases of gall-stone obstruction. Of the 16 cases, 11 died and 5 recovered, making the mortality about 69 per cent. The average age was about 55 years, agreeing with Courvoisier's statistics. From six of the leading surgeons of this city, I was able to collect but four cases. Two of the men who had had the longest and most active careers had never seen a case. Of the four collected there was but one recovery and three deaths. The figures show not only the rarity, but also the high mortality following operation for the relief of the same.

Courvoisier's statistics show that the average age is between 50 and 70. Of the three cases which I am reporting, two occurred after middle life. It occurs about five times more often in females.

Method of Entrance of Calculus into the Intestinal Tract.—This is of great interest, as likewise is the fate of the gall-stone in the intestine. There is often found a clean history of gall-stone disease in these cases, but in the majority of the cases there is no previous history of trouble of this kind. Stones large enough to produce obstruction usually find their way from the gall-bladder into the intestine not by the natural passage. The pathological process of various entrances may be analyzed in the following way:

1. First and foremost, by the extension of the inflammation from the gall-bladder. The stone passes through the wall of the gall-bladder into some portion of the intestinal tract.

2. By being blocked in the common duct, and the extension of the inflammation continuing, ulceration forms an anastomosis between the common duct and the intestinal tract through the duodenum.

3. The same process occurring by anastomosis between the cystic duct and the intestinal tract.

4. The stone may pass through the cystic duct and the common duct on into the bladder by dilating the latter.

5. The stone may gain entrance into the transverse colon, and, if so, pass out without producing symptoms of obstruction.

The entrance of large gall-stones through fistulous openings into the intestines occurs oftener than has been suspected, and the possibility of its occurrence must not be forgotten. In fact, we must conclude that the occurrence of intestinal obstruction, after the passage of gall-stones from the gall-bladder into the intestines, is surprisingly frequent, owing to the large size of these stones. Courvoisier reports ileus in 28 of 73 cases, or 38 per cent. These openings occur between the posterior surface of the neck, body, or fundus of the gall-bladder into the first part of the duodenum, namely, that part of the duodenum which is so often bile stained at autopsies.

A gall-bladder-duodenal fistula is more frequently found than an opening in the colon or other sections. Out of 30 fatal cases, 28 were due to gall-bladder-duodenal fistulæ, and only two to gall-bladder-colon perforations (Courvoisier[10]). There was but one between the gall-bladder and the ileum. It is emphasized by Courvoisier that stones large enough to produce ileus with rarity ulcerate through the choledochus wall. He further called attention to the fact that at the end of the eighteenth century there were but nine cases of gall-bladder-intestinal fistulæ recorded, while three times as many cases of intestinal obstruction due to gall-stone had been reported. This fact shows the unsuspected frequency of associated inflammatory and ulcerative processes in many of these cholelithic obstruction cases.

The Vagaries and Wiles of Cholelithiasis.—The devious

ways and paths through which stones have been found to wander, as exemplified in many reported cases of cholelithiasis, is most interesting, and have been the cause of much complex pathology, viz.: They have been passed through the urethra, as in a case of Elsner's.[11] Postmortem disclosed in this case a fistulous track leading from the gall-bladder to a perinephritic abscess, this extending to the right kidney where a stone was found, one having passed by the ureter to the bladder and on out. An abscess may continue to perforate downward, and the stones in this way perforate directly into the urinary bladder. Courvoisier reports seven cases of urinary fistulæ associated with gall-stones. Barroud [12] reported a case where 200 stones passed the urethra within eight days, and the patient recovered. Naunyn reports a case in which Mikulicz operated for pyloric stenosis, which was supposed to have been caused by an ulcer. A large gall-stone was found forming the base of the ulcer. Morgagni [13] reports a case in which the common duct was dilated to the size of the stomach, and filled with stones. Such enormous dilatations of the common duct may readily be mistaken for pancreatic cysts—all the more so, on account of the topographico-anatomical relations of the common duct to the pancreas, and also from clinical experience secondary affections of the pancreas have been proven to depend upon gall-stones.

Numerous cases have been reported where they have ulcerated into the stomach and have been vomited up. Case 124 of my series exemplifies and explains the pathology of this condition clearly.

Case 124.—Mrs. M. E., age 43. Operation, Oct. 21, 1909. She had trouble referable to this region off and on for many years. Operation disclosed an anastomosis between the gall-bladder and the stomach, showing that a gall-stone later would probably have anastomosed through the ulceration into the stomach. This case explains the condition found in those cases on record where gall-stones have been vomited up.

Diverticula back of the head of the pancreas have been found to contain stones, passing out from the cystic duct.

Diverticula in the intestines have been their hiding place. There may be a lodgement in the intestine at the site of a malignant growth, or in the appendix of the smaller stones. An abscess in the thigh of a woman revealed them (a case of Porges), and so on. In Case 27 of my series there was a biliary fistula opening on the abdominal wall.

CASE 27.—P. M., age 67, male. Operation, Oct. 21, 1904. He had had a biliary fistula opening on the abdominal wall for 14 months. There was a continuous discharge of bile, and at various intervals a number of gall-stones had worked their way out. Operation disclosed a stone in the common duct, as well as others in the gall-bladder. Cholecystectomy was done, with recovery of the patient.

So it is readily seen that the fate of the gall-stones in the intestines varies. I have mentioned above some of its vagaries. Fifty per cent., after long-standing obstructive symptoms, pass per *vias naturales*. The rest, after varying intervals, with repeated recurring attacks, depending upon the advancement of the stone, become finally arrested, and, if not relieved, generally produce perforation and peritonitis.

Numerous cases have been reported to me where they have been passed spontaneously. I am incorporating one case, as given to me by Dr. H. C. Algire, of Baltimore, which is of interest at this point:

Patient was a short, stout woman, age 72. She had an acute onset of severe abdominal symptoms of the complete obstruction type, after having given a history of mild obstructive attacks for a number of months preceding. Her condition grew desperate, and her life was despaired of. After ten days of complete obstruction, while she was lying in a stupor, the bowels moved copiously, and it was seen that a large gall-stone was passed. She gradually returned to consciousness and recovered. She lived five years after this, without further evidence of this trouble.

The Site of Impaction.—In all of the reported cases it seems to be borne out that the principal location where the stones are blocked and produce ileus is in the lower ileum, that is, the greatest percentage is found in the lower ileum. Courvoisier's analysis of 52 cases shows this very clearly, as well as the other points of impaction:

Duodenum	3	
Jejunum	4	
Upper jejunum	1	
		8
Upper ileum	4	
Middle ileum	1	
Ileum	18	
Lower ileum	10	
		33
Ileocæcal valve	7	
Vermiform appendix	2	
		9
Sigmoid flexure	2	
		2
Total		52

Manner in which Obstruction is Produced.—In gall-stone ileus there is either partial or complete interference with the onward movement of the contents of the bowel. In the former there will be well-defined symptoms of obstruction which may or may not be severe in character. As the movable mass finds difficulty in its progress, or produces further spasm of the intestinal wall, these attacks of ileus are repeated. It should be remembered that the interior of the small intestine, unlike the colon, is covered with the folds of the valvulæ conniventes, so that a large, rough calculus, with angular surfaces, is apt to meet with difficulty in finding its way along such a canal; which difficulty is further increased, due to the anatomical fact that the small intestine becomes narrower from its upper to its lower end. These attacks recur with greater violence until the stone passes the ileocæcal valve and escapes per *vias naturales* or else becomes arrested in the lower ileum, the most common seat of complete blockage. It is with this form of gall-stone obstruction that the present paper is alone concerned. As a rule, calculi produce intestinal trouble within a few days after reaching the intestine, but as to the time obstruction may come on after the stone enters, it is

purely speculative. Cases have been reported where the stone was assumed to have remained in the bowel ten years (Eve's), reported by Treves.[14] Mayo Robson cites a fatal case where the stone weighed only 55 grains.

The common type of gall-stone ileus is usually unassociated with strangulation, and in the majority of cases reported it is clearly understood that there is an impaction of a large concretion in some part of the intestinal tract, producing a mechanical block. In a given case, however, we may have three varieties of ileus:

1. Adynamic: due to a paralysis, from some cause, of the peristaltic wave of the intestine.

2. Dynamic: which depends simply upon the failure of the abdominal wall to overcome the resistance offered. The spasm beneath and around the calculus is the chief cause of the obstruction.

Mechanical: (*a*) obturation ileus, which is an arrest from blockage of the onward movement of the fecal current; (*b*) strangulation ileus, which involves not only the arrest of the intestinal contents, but the arrest or interference with the circulation in the bowel segment involved. The bowel soon loses its viability, as is shown in Case 3, of my series. Inflammatory changes in the lumen rapidly occur, and, consequently, these cases are much more rapidly fatal than in the obturation type of mechanical ileus.

Extensive research work in this field, done by Bouchard, Albu, Clairmont, and Ranzi, in connection with the cause of the mortality in these cases, points to auto-intoxication as the prolific cause, and they are of the opinion, with Kukula,[15] that the reflex theory of the symptoms of ileus is no longer tenable. They are strongly of the opinion that the symptoms of collapse and depression are entirely due to auto-intoxication. There are others, however, who hold strongly to the belief in other elements as the cause of these deaths.

Symptoms of Intestinal Obstruction.—The clinical history may or may not show evidence of pre-existing gall-stone disease—cholecystitis, stone in the various ducts, etc. In a large percentage of the cases, however, the history shows some evi-

dence of disturbance in this region. The symptoms of tenderness and pain associated with fever may have occurred at some previous time, incident to the ulcerative process at the time of the escape of the stone from the gall-bladder. In many cases no such symptoms are elicited, and in others only vague symptoms of colic, bilious attacks, etc., which have occurred through a period of a number of years previous to the onset of the obstruction, with or without jaundice.

When the ileus occurs there is always present in the picture the cardinal signs which embrace a definite syndrome of symptoms, consisting of pain, nausea, vomiting, coprostasis, and tympany. In all out-spoken cases these are present, one or more varying in intensity with each individual case. There is a history of gradual, rather than sudden, onset, unless the point of blockage is high up in the ileum or jejunum. In such cases there is sudden onset, associated with intense pain and marked peritoneal shock, and early fecal vomiting, without much distention. Pain is the most conspicuous, most common, and most pronounced symptom of the group. It is always severe and constant. It is of a colicky character, subsiding at times and then recurring, as the fatigued intestinal muscles recover their peristalsis and make further efforts at expulsion. Although always pronounced, it is not as severe as the pain that accompanies strangulation. The pain is due to the tension and torsion of the nerves of the mesentery (Lennander[16]).

Vomiting is persistent throughout. It appears at the beginning of the attack and continues uninterrupted until the obstruction is relieved. The higher up the obstruction, the more marked the vomiting, the more incessant, severe, and copious. In a short while it becomes stercoraceous, which is not due to the reversed peristalsis as was formerly thought.

In a complete attack of ileus, there is complete arrest of the fecal current. This is absolute as far as the passage of fæces and gas is concerned. This condition is interpreted in a very confused way; by many it is thought that if a high enema brings some results, there cannot be an obstruction. This often is the chief cause of delaying operations.

Local tenderness is not, as a rule, elicited by pressure of the examining hand, as in cases of obstruction from other causes. It is chiefly of use as an aid in cases of peritonitis. Limited tenderness may appear and be of some diagnostic value. The blocking stone is seldom palpable. Diffuse tenderness generally means the onset of peritonitis. In most cases the evidence gained by the examining hand is of much importance, as it aids in the differential diagnosis.

The stiffening of the belly muscles and the marked universal spasm and rigidity which is noted in peritonitis are generally not noted in acute intestinal obstruction. Tympany and meteorism are markedly pronounced in some cases, but usually not so marked as in acute strangulation types. When visible peristaltic loops are seen, they are of great aid and point very clearly to mechanical obstruction, as there is generally an absence of visible peristalsis in peritonitis. There is usually an absence of temperature, and high leucocytosis is present. X-ray examination up to the present time is of no special value.

Many cite with confidence an array of symptoms which points to the diagnosis of gall-stone ileus, but, for my part, I think that we can only suspect from the symptoms a possible gall-stone ileus, and that we cannot diagnose with certainty a case of this kind.

Differential Diagnosis.—The diagnosis of gall-stone ileus is seldom made with certainty. Many acute cases, having to do with gall-bladder surgery, simulate obstruction very closely. This occurs in the experience of every operator. Acute gangrenous cholecystitis, acute empyema of the gall-bladder with pericholecystitis, acute common-duct obstruction—in many such cases I have seen all the symptoms of acute obstruction, which immediately cleared up following operation for the relief of same.

Many acute conditions of the abdomen have to be considered in the cases that present themselves: peritonitis from its various causes, obstruction in the ureters, acute pancreatitis, acute torsion of an ovarian pedicle with its inflammatory symptoms, acute appendicitis, etc. So that many times the best that we can do is to recognize early that there are obstruc-

tive symptoms, and not waste time in speculation as to the cause but give surgical aid as promptly as possible. There is no condition in surgery so imminently calling for early help as intestinal obstruction from any cause. Although it is stated that in 50 per cent. of the cases the stone is passed spontaneously, one assumes a highly dangerous supposition when he assumes in a given case of stone obstruction that they will adopt that course, and in consequence a waiting or expectant plan of treatment is resorted to with the probable loss of the patient's life and the late operation credited with the mortality.

Mortality.—The disease is a peculiarly fatal one. Out of 280 cases collected by Schuller (of Strasburg), Dufort, and Courvoisier, 156 died. Other statistics place the mortality at about 50 per cent. The mortality after operation has been in the past very high, due, I gather, to the late resort to surgery. Naunyn makes the statement, after considering the results of 13 operations for ileus due to gall-stones of which number there was only one recovery, that laparotomy is not to be recommended. Langenbuch, on the contrary, took a different view. He made the unqualified statement that gall-stone obstruction is a surgical disease, the treatment of which is to be intrusted to the physician only during a very short period.

The statistics give varying figures as to the mortality following operation. Lobestein found out of 31 cases operated upon a mortality of 61 per cent.; Courvoisier out of 125 operations found a mortality of 44 per cent.; Schuller found out of 82 cases of operation a mortality of 56 per cent. Korte is reported to have saved four out of five consecutive cases. The present-day statistics that I have collected, unfortunately, still give a high percentage of mortality, namely, 69 per cent. The advanced age of the patient, the fact that the operation is undertaken as a last resort, and the long-standing auto-intoxication are the chief reasons for this high mortality. It varies within such wide limits, however, as to make it impossible to draw any conclusions of value. Suffice it to say, that the mortality is always high, for the reasons mentioned,

and is unquestionably highest in the hands of those surgeons who operate late. I wish to emphasize that this high percentage of mortality at the present time should be considered a disgrace, although the surgeon is not responsible for it. The mortality from operation should be *nil*, and will be *nil*, if the internist in the future will have his cases operated upon early, and not let them drag through repeated attacks of obstruction until they are practically all-in, before surgical aid is sought.

Operation.—This is our only means of correcting the difficulty, and so should be given as promptly in each individual case as possible. Delay in this condition is more fatal than in any other lesion. General anæsthesia is to be preferred when the condition warrants it; if not, a local anæsthetic may be used. The incision is usually placed in the right or left rectus, and the obstructing point sought with as little evisceration as possible. If the loop can be brought up to the surface, the bowel should be opened and the stone removed. The question of pushing the stone onward is usually not feasible, and it is far more dangerous than delivery of the stone through a longitudinal or transverse incision in the bowel wall. The putrid contents of the distended loop should be emptied preferably through a Monk's tube. This obviates in many cases the fatal issue, by doing away with further absorption of the decomposing, retained products. This is an important point, and should be made use of invariably. From personal communications that I have received, the cause of death in their cases has been attributed to neglect of this point. The opening in the bowel can be easily closed by a Connell and Lembert suture, and the bowel dropped back into the abdomen. If the segment of bowel at the point of obstruction is still viable, this is all that is needed; if not, a resection will have to be done, and either an end-to-end or lateral anastomosis be made. Drainage is needed, in my opinion, if there has been much soiling of the abdomen at the time of the operation and if the peritoneum contains much bloody fluid. I regard this as important, and usually make use of rubber tube drainage, placed well into the pelvis, and the abdomen closed around it. The

patient should be put in a Fowler's position, and proctoclysis begun as soon as the patient is returned to bed. These steps have been made use of in the three cases presented.

I wish to emphasize this point—that the toxæmia in these cases is the chief factor to be combated, and we can do this best by thoroughly washing the stomach before operation, thoroughly draining the distended loop above the obstruction at the time of the operation, and giving freely and abundantly salt solution both at the time of the operation and afterwards —intravenous if necessary, or intracellular in all cases, along with salt solution by rectum. I believe if these steps are followed, more lives will be saved, even if the operation is resorted to late.

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A NEW DECOMPRESSION OPERATION FOR THE BRAIN.

BY WILLIAM H. HUDSON, M.D.,

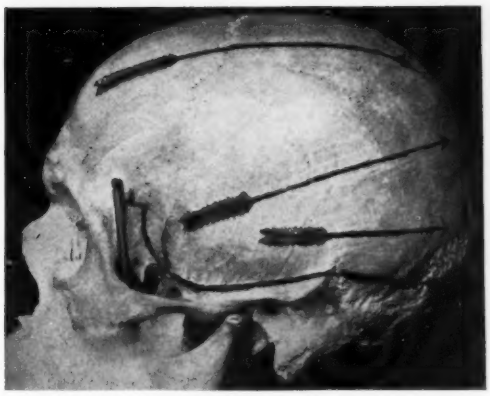
OF ATLANTA, GA.

NOTWITHSTANDING increased knowledge of cerebral localization and improved technic in brain surgery, the number of palliative operations is constantly increasing. These decompression operations not only preserve the sight but ameliorate other distressing symptoms, and may give the neurological surgeon additional time for the localization of the tumor, and perhaps its surgical removal. Moreover, decompression of the brain as a therapeutic measure is daily increasing, many conditions of the brain demanding this operative procedure other than tumors.

In Great Britain the customary decompression operation has been the making of a large permanent opening in the skull, preferably over the so-called silent areas in the brain. As the dura is generally opened in such cases, nothing but scalp is left to protect the brain, and the increasing intracranial pressure soon produces an immense hernia of the brain, with damage to the protruding part, even to the extent of destroying its functions. Later the protrusion may become so large as to rupture the line of union in the scalp, a most distressing and undesirable condition.

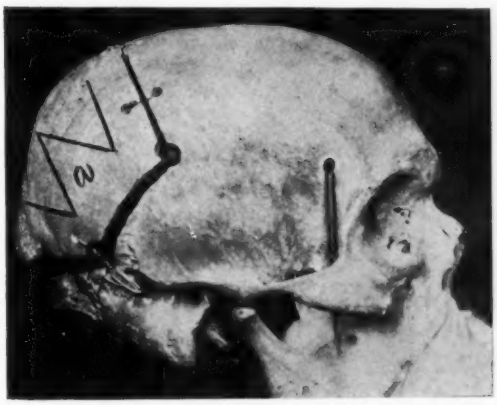
On the Continent, many surgeons make the usual trap door in the skull, and replace it, allowing the pressure to force it out, and thereby have all the undesirable conditions found in the British method. In the United States, the subtemporal method is much used; the protruding brain is controlled better by the layer of muscle and fascia in addition to the scalp which covers the protruding mass. Otherwise the brain is damaged in being forced out through the circumscribed opening in the skull, and as I have seen in several cases, a paralysis promptly appears on the opposite side, due no doubt to dis-

FIG. 1.



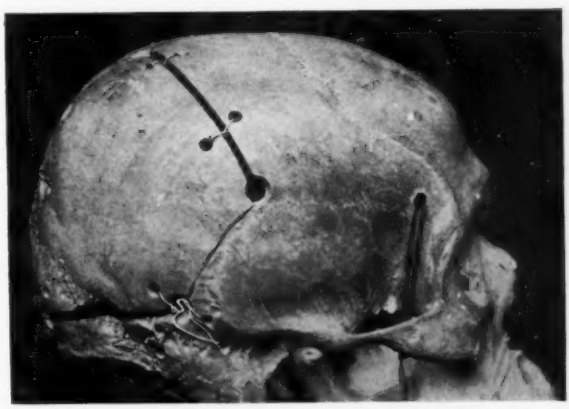
Arrows show direction in which entire hemisphere may be displaced.

FIG. 2.



Decompression flap when a tumor is unlocalizable, and no effort made to reach it. The expanding silver sutures show straightened out. *a*, shows the W-shaped incision in the dura.

FIG. 3.

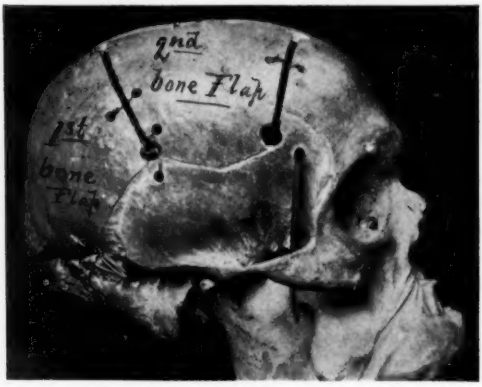


Shows the decompression bone flap replaced by the looping of the expanding silver sutures.

FIG. 4.

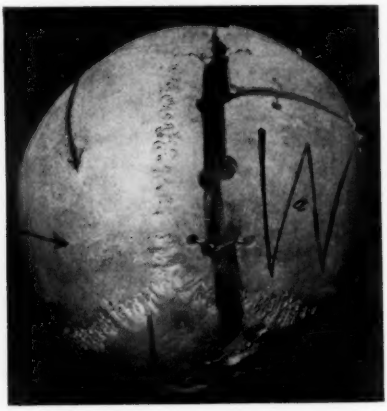
Shows the posterior view with three expanding sutures shown looped.

FIG. 5.



Shows the two bone flaps as made when the operative point is in the motor region or in front of it. This also shows the two flaps looped down. Also represents the exposure of the brain in operations for apoplexy.

FIG. 6.



Shows the limit of expansion when two bone flaps have been made.

placement of brain substance into and toward the opening in the skull, which is smaller than the hemisphere.

To obviate the local damage sustained by the brain in being forced out of a circumscribed opening in the skull, and to prevent a later hernia of the brain and the possible tearing asunder of the scalp wound and to allow the restoration of the calvareum should a cure be established, a new method of decompressing the brain has been carefully worked out, and is as follows:

NEW METHOD OF DECOMPRESSING THE BRAIN.—Fig. 1 shows the direction in which the entire cerebral hemisphere can be displaced without damage to any local areas. *This*

FIG. 7.

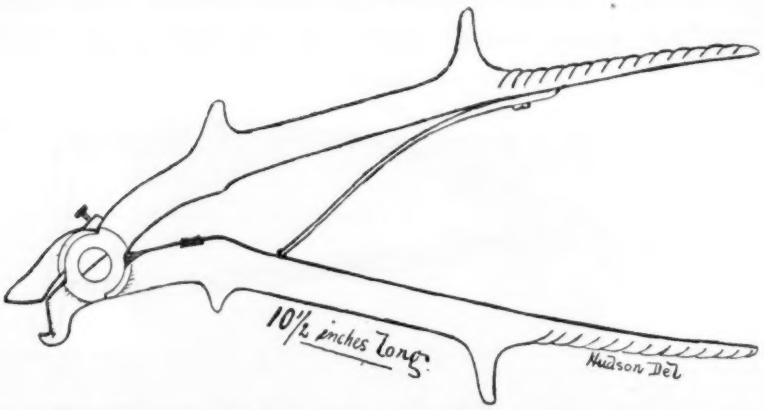
The drill guide is shown grasping the bone and locked. The lower blade is cupped for receiving the drill point, and protects the brain and dura. The upper blade pushes the scalp aside and guides the drill as it penetrates the bone. The lower blades will pass into the trephine opening, and the round shank of the blades will move freely in the channel cut in the making of the bone flap.

fact is the chief point in the operation. In those cases of unlocalizable brain tumors where the decompression is necessary, the area exposed is the entire posterior portion of the brain, so that the entire hemisphere may be displaced backward, thus avoiding localized damages. The lower limit of this flap is the lower limit of the cerebral hemisphere behind, its upper limit is where the skull begins to curve in a downward direction. The fissures and convolutions of the brain are not considered. If the growth has been localized in the motor region and not removed the second flap is made over the posterior portion of the brain, thereby making two flaps as indicated in Fig. 5. The same process is applied to the left side of the brain, the greatest care being used not to injure the cortex.

Technic.—A special surgical armamentarium is necessary, as the work must be done quickly and easily, without shock or jar to the patient or fatigue to the surgeon's hands, self-stopping trephines and two-hand forceps being absolutely necessary. Other instruments to expedite and simplify the operation are demanded, such as drill guides, bevel forceps, and spooned brain spatulas.

The ordinary decompression operation over the posterior region of the hemisphere is done after the method herein de-

FIG. 8.

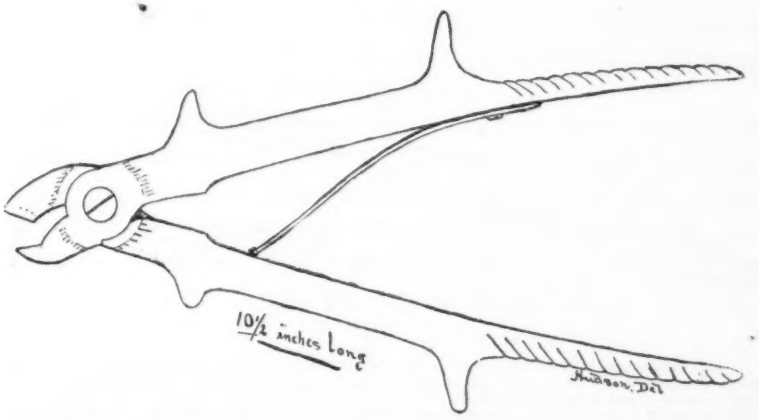


Hudson's two-hand channel-cutting forceps. With these forceps two bone flaps representing 15 inches of channel can be cut in the densest and thickest skull in three or four minutes, without shock or jar to the patient, and without fatiguing the surgeon's hands.

scribed in detail: The head is shaved just before the operation, and a strong rubber tourniquet applied as low on the head as possible. The writer's usual osteoplastic flap with short central bevel is rapidly made. Two openings are made in the free border of the flap, three-quarters of an inch apart. These openings are united by the smallest size Gigli wire saw, making a cut on a bevel. The other holes are united by the writer's two-hand channel-making forceps. Opposite the primary trephine openings the skull is firmly grasped with the drill guide and small ⅛ inch openings made for the silver wire sutures. The flap is now broken back by inserting elevators under its anterior and posterior borders. If the base does

not break readily it is weakened by cutting a short channel under the scalp from either side toward its centre by the writer's under-cutting forceps. Silver wire of eighteen or twenty gauge is twisted carefully but quickly into the openings opposite the bone flap. These wires are left six or eight inches long so as to be readily inserted into the drill holes in the bone flap. The dura is now opened, leaving a broad margin around the edge by an M- or W-shaped incision (Figs. 2 and 6), great care being taken not to injure the cor-

FIG. 9.



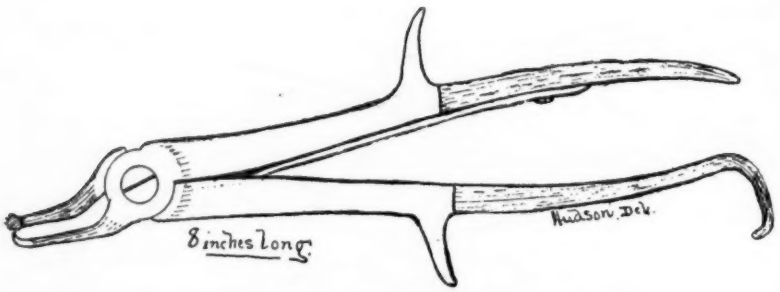
Hudson's cerebellum forceps for the permanent removal of bone over the entire cerebellum when an osteoplastic flap is not considered. This forceps may be used for cutting away the inner edge of bone in decompression operations so that the edge of bone will not injure the brain as the brain is extruded through the opening.

tex. The silver wires are now inserted into the drill holes in the bone flap and twisted, allowing about half an inch of slack. Each of the wires are then caught with artery forceps and twisted down until the bone flap fits snugly over the brain. The scalp is then closed carefully with interrupted fine silk sutures. The fitting back accurately of the bone flap prevents œdema of the brain, and yet all the benefits of a decompression operation are secured.

Should the tumor continue to grow, the bone flap is gradually lifted as the pressure straightens out the loop in the silver wire. Should pressure symptoms reappear and the

bone flap not be lifting, a sharp stylet may be inserted through a cocainized point in the scalp, and the bone flap given a lift. This may be continued until all the loops in the silver sutures have been straightened out. The limit of the expansion of the skull is reached before the scalp gives way, which may have taken months or years. In the meantime, if the surgeon has found and successfully removed the tumor, the decompression bone flap may be replaced by twisting the loops again. If the tumor has not been found and has continued to grow, all the relief possible has been obtained from the decom-

FIG. 10.



Hudson's special bevelling forceps for removing the inner edge of bone in all decompression operations. This applies to the subtemporal, and the ordinary decompression operation where nothing is left but the scalp; and as well to the writer's method. By bevelling the inner edge of bone much less damage is inflicted on the brain substance, as the pressure forcibly extrudes it through the opening in the skull. In the writer's method of decompression, this danger is not a serious one, nevertheless the internal sharp edge of bone should in all cases be carefully removed.

pression, and the disadvantages of the old methods of decompression have been obviated.

It is the writer's practice to cut off the sharp inside edges surrounding the bone flap. This is best done with his two-hand cerebellar forceps, or with his special bevel forceps, shown in Fig. 10.

If an effort has been made to remove a tumor in the motor region, which failed, two osteoplastic flaps are made. They are fixed back in position, as shown in Fig. 5. Both of these flaps expand under the pressure of the growth. This decompression is very similar to nature's method in young children, where the sutures separate, giving a uniform enlargement of

the skull, with the advantage that later on, should the condition be cured, the section or sections of the skull may be replaced to the proper position.

The writer has found that this operation can be done quicker and with much greater ease than the subtemporal operation, where the bone must be slowly bitten away under the temporal muscle.

Many points in the technic of cranial surgery have not been touched on in this article. The writer's methods are fully discussed in "The Technic of Cranial Surgery" and in "The Technic of Operating on the Brain in Deeply Located Lesions Attended with Increased Intracerebral Pressure, especially Apoplectic Hemorrhages."

NOTE.—An entire series of two-hand forceps have been carefully worked out; not only for operations upon the skull, but for operations on the spinal cord. The two-hand principle has been found absolutely necessary for the successful performance of the work as represented by the writer's new technic especially for deeply located tumors, apoplectic clots, etc.

"LE RHUMATISME TUBERCULEUX" (PONCET).*

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RHEUMATISM is not a disease, it is a term covering certain clinical manifestations caused by various toxi-infectious agents.

The search for a specific cause has led to the partial dismemberment of acute rheumatism. Gonorrhœal rheumatism, the first child from the loins of this time-honored parent, was born in great travail. Petronne and our fellow member Dr. Kammerer, had the honor of proving the genetic relationship between gonorrhœa and gonorrhœal arthritis. Clinically, gonorrhœal rheumatism is accepted as an entity; we also recognize a diphtherial, a pneumonial, and scarlatinal rheumatism, yet tuberculosis, the commonest of all toxi-infectious diseases, we hold as blameless.

If during the course of a gonorrhœal arthritis, a patient has a spontaneous attack of acute rheumatism, we assume it to be gonorrhœal in nature. If this is so, Poncet says, it is just as reasonable to assume that articular manifestations arising in tubercular cases may be of a tubercular nature.

Poncet and his pupils of the Lyons School hold that tuberculosis is a very common cause of rheumatism, advancing bacteriological, pathological, and clinical proofs. As surgeons it is our bounden duty to give Poncet's views our serious attention; subject them to the chastening hand of practice, and then accept or reject them.

History.—Bonnet in 1845 called attention to the transformation of rheumatic joints into true "white swellings." The medical writings of this period convey the impression

* Read before the New York Surgical Society, February 14, 1912.

that the clinicians were aware of an ill-defined relationship between chronic rheumatism and tuberculosis.

In 1854, Charcot crystallized these views, calling attention to the great mortality from pulmonary tuberculosis among patients suffering from chronic rheumatism. Again, in 1864, he emphasized the important part that scrofula played in the family history of patients suffering from chronic progressive rheumatism, and remarked on the slowness with which phthisis developed in such cases. Fuller, in 1860, in a series of 110 cases of arthritis deformans, found that 23 per cent. had lost either a father, a mother, a brother or a sister by phthisis. In 1874, Gubler, a pupil of Powell, wrote a very interesting thesis, "Pseudo-articular Rheumatism Occurring in the Course of a Tubercular Diathesis." His findings were promptly ignored.

Scattering observations by Laveran, Pollossom, and suggestive hints by Molliere and by Mauclaire have an historical value when viewed in the light of Poncet's investigations. In 1892, Grocco, the Italian clinician, reported nine cases of "Pseudo rheumatismo articolari tubercolosi" and commented on the uselessness of the administration of salicylates in such cases. He considered the tuberculosis to be secondary to the rheumatism.

Poncet's personal communication entitled "Pseudochronic Tubercular Rheumatism," was presented to the French Surgical Congress in 1897. His investigation of the subject began in 1896.

Poncet's views met with great opposition, the existence of a tubercular rheumatism was stoutly denied. Patient and painstaking accumulation of laboratory and clinical facts with their careful presentation before numerous French societies has stimulated a clinical interest in the subject. Without a personal study of the literature, it is impossible to realize the amount and the extent of the work covered by Poncet and his pupils. I think it can be fairly stated that tubercular rheumatism has won a foothold in France. In this connection it is interesting to note that Tixier has given an excellent summary

of tubercular rheumatism in the *Précis de Pathologie Chirurgicale.*

In Germany the opposition is still marked. The subject of tubercular rheumatism was presented before the Northwest German Surgical Society (1910) by Muller and aroused a lively discussion; Muller, though not agreeing with all Poncet's teachings, held that his work contained some pregnant truths which required further consideration.

Prior to last year, the English literature contained no satisfactory exposition of Poncet's views. There were a few isolated references such as Edsall's, Lavenson's, and Weber's. In 1910, Prof. Alexis Thomson, of Edinburgh, read a paper entitled "Le Rhumatisme Tuberculeux." This paper gives a clear and accurate résumé of Poncet's views. Thomson offers no decided opinion, but says the subject is worthy of the most serious consideration.

In the course of our academic and clinical training, we have gradually absorbed certain individual mental pictures of what tuberculosis is and what it does. When we call anything tubercular our mind naturally recalls the histological picture of tuberculosis with its tubercles, its giant-cells, its bacilli, and the other points which go to make the microscopical diagnosis. In other words, tubercular tissue gives a specific microscopical picture. Now, we must ask ourselves, can the tubercular bacillus or its toxins produce other lesions? It is a well-known fact that the tubercular bacillus and its toxins do produce lesions which do not show the specific picture and which cannot be distinguished from those of the ordinary chronic inflammation, yet these lesions can often be proved by clinical or experimental means to be tubercular in origin. Pathology has demonstrated that tuberculosis can produce amyloid degeneration of kidneys, sclerosis of pancreas, and other well-known lesions; yet the tubercular bacillus cannot be demonstrated in these organs.

Poncet claims that there are a great many lesions in which we cannot obtain the specific picture, and to these lesions he

gives the name inflammatory tuberculosis, in order to distinguish it from specific tuberculosis. Briefly, Poncet's conception is, that tuberculosis is not one in its manifestations. Beside producing a specific picture, it can produce the signs of an ordinary inflammation, such as congestion, exudation, sclerosis, etc., and these signs have nothing specific about them, but are the same as the result of any ordinary inflammation.

Tubercular rheumatism is then a manifestation of tubercular inflammation as distinguished from specific tuberculosis. Poncet uses the word rheumatism in the broad sense and does not restrict it to serous and synovial membranes, but includes many extra-articular lesions.

Nature and Pathogenesis.—According to the figures of Poncet and his pupils 5 to 17 per cent. of patients with active tuberculosis and 20 per cent. of the chronic cases have or have had tubercular rheumatism. These figures hold true for surgical and medical tuberculosis. Reversing the process and examining the rheumatic cases for tuberculosis, he finds the figures substantially the same. In this, Poncet includes those cases which were thought originally to be simple rheumatism, but which later unexpectedly developed pulmonary or other tubercular lesions. In the chronic, deforming rheumatism of old age the percentage is doubled, that is 40 to 50 per cent. of these cases can be shown to have tubercular lesions. These figures are from clinical and autopsy records, and are the result of numerous observations by various investigators. If experience proves this observation to be correct, then tubercular rheumatism will have a firm clinical basis.

The occurrence of an acute synovitis in a tubercular joint, after the injection of tuberculin, is well known; a similar reaction can be obtained in some joints supposedly rheumatic: it has also been obtained in cases which have come to autopsy, in which no tubercular lesions were found in the joint, but tubercular lesions were found elsewhere. By animal experimentation it can be shown that it is possible to produce a

serous synovitis by an intravenous injection of tubercular material, and that by the injection of certain cultures of bacillus of Koch (homogenous cultures of Arloing) the common lesions of inflammation can be produced in contradistinction to typical tubercular lesions.

Tixier says that the intimate pathogenesis remains obscure. The question is, are these lesions caused by an attenuated bacillus of Koch, or are they the result of toxins elaborated in a distant focus? Experimentation tends to show that toxins produced at a distance do not cause a sufficient irritation in the tissue; this irritation can only be produced by the adherent poisons of the bacilli. If this is true, then it is necessary to demonstrate a bacillus in the lesions of tubercular inflammation. Whether the tubercular inflammation is caused by the pure toxins or directly by the bacillus is impossible to say.

Melchior, 1910, reports a case of acute tubercular rheumatism in which he was able to demonstrate a tubercular bacillæmia. He considers this as having an important bearing on the cause of " Morbus Poncet."

Pathology.—In studying the morbid anatomy of the process, we must keep Poncet's conception of tubercular inflammation as distinguished from specific tuberculosis clearly in mind. In the acute joint lesions, if we except Laveran's rare granular form, we find the ordinary manifestations of inflammation. The synovia is congested and swollen; the cartilages show erosions and superficial ulceration; the periarticular structures are infiltrated; the joint fluid clots readily, due to the high fibrin content, and shows an intensive reaction to Arloing's and Courmant's agglutinating test.

Poncet divides the chronic cases into two classes. The dominant feature of the first class (*forme atrophique ou medullisant*) is the atrophy of the tissues concerned. Clinically this group is recruited from the ranks of the ordinary polyarthritis deformans; a few cases of osteoporosis without deformity are occasionally encountered. In the second class (*forme plastique hyperostosant*), the prominent pathological

feature is the production of new tissue. This form has two types, a dry arthritis and an ankylosing arthritis. The dry arthritis has as its prototype "morbus coxæ senilis," with its peripheral proliferation of osseous tissue, its capsular retraction, and consequent interference with function. It is not a bony ankylosis.

Clinically the ankylosing tubercular arthritis is met with in the spondylitis deformans of man and animals. The ankylosis may be between the articular surfaces or be caused by the involvement of the periarticular structures. Both fibrous and osseous ankylosis occur. The fibrous is more common than the osseous, but all transitional forms are met with.

CLINICAL FORMS.

ARTHRALGIAS.—The myalgias, hyperæsthesias, and neuralgias of tubercular patients are well known. These "algias" are probably caused by the tubercular toxins.

To the indefinite rheumatoid pains met with in tubercular patients, Poncet gives the name tubercular arthralgia. These pains as a rule are light, show a tending to shift, and have a predilection for the larger joints. They may be the first warning of a latent tuberculosis, and suddenly vanish upon the appearance of an active tubercular lesion; again they may develop into a true tubercular arthritis. They are frequently mistaken for growing pains or for tubercular arthritis; this latter mistake undoubtedly accounts for some of the marvellously rapid cures of tubercular hips and spines. A knowledge of the possibility of their relation to tuberculosis is invaluable.

ACUTE OR SUBACUTE TUBERCULAR RHEUMATISM.—This form is characterized by the rapid involvement of one or several articulations, giving rise to a more or less perfect picture of an acute rheumatism; it may be primary or secondary to a visceral tuberculosis. From the nature of things the primary form is exceedingly difficult to diagnose. A grave general condition with a moderate involvement is a presumption in favor of tubercular rheumatism.

The secondary form has a variable prognostic value. In this connection it is interesting to note that there is very clear and constant relationship between the visceral and articular attacks; when one advances the other recedes. The use of the salicylates in tubercular rheumatism is not only valueless but may be harmful. In nearly all the cases which have had repeated attacks of tubercular rheumatism, the pulmonary tuberculosis is of a fibroid character and advances very slowly.

Poncet considers the following to be a typical case; it is taken from Gautier's thesis, "Primitive Tubercular Rheumatism."

A veterinarian, 50 years old; diagnosis, fibroid phthisis with a large cavity limited to right apex. Mother died of phthisis, one sister lost a child from tubercular meningitis. The patient developed an articular rheumatism at 20, in bed for three weeks; all the articulations, including the temporomaxillary, were involved; therapeusis unavailing; prolonged convalescence. Ten years later a similar attack, the same in extent, intensity, and duration. Eleven years later, a third attack of arthralgia; suddenly the pulmonary condition manifested itself, and all the articular symptoms disappeared.

Poncet cites another case in which the termination differs. The patient lived among tubercular subjects. Suddenly without any apparent cause he was seized with an acute polyarthritic rheumatism; the convalescence was greatly prolonged. When the pains disappeared, the elbow, wrist, and foot were radiographed and showed a bony ankylosis. Two years later a diffuse infiltration of the apex was discovered and the nature of the lesion confirmed by a positive seroreaction.

CHRONIC TUBERCULAR RHEUMATISM.—This is encountered more frequently in the second period of life, and may be primary or secondary to repeated attacks of acute tubercular rheumatism. Four clinical varieties are distinguished: deforming tubercular polyarthritis; chronic polysynovitis; dry senile arthritis; ankylosing tubercular rheumatism. These may occur independently or be found side by side in the same individual.

Deforming Tubercular Polyarthritis.—This is the ordinary arthritis deformans or rheumatic polyarthritis most often met with in young people and not infrequently in children. Drevet met with a case in a child three years old, and

others at ten and thirteen years. Poncet gives radiographs which show that there is a certain rarefaction at the ends of the bones. For the diagnosis we must depend on the history, the seroreaction, the presence of tubercular lesions elsewhere, and the future developments.

Chronic Tubercular Polysynovitis.—In this form the toxin seems to limit itself to the synovia of the tendon sheaths and articulations; there is no bony involvement, and articular deformities are lacking. All varieties in all stages of virulence may be found in the same patient: plastic synovitis, serous synovitis; purulent synovitis, etc.

As an example of this, Poncet quotes the following case: A woman, 41 years old; mother died of phthisis, three brothers died from surgical tuberculosis, another from Pott's disease. At infancy the patient had ciliary blepharitis and glands of the neck; tubercular arthritis at eight, double synovitis of the flexors of the fingers, double synovitis of the radial sheaths, synovitis of the long extensors of the thumb; both hands, especially the left, bent toward the cubital side; added to this a chronic articular synovitis of all fingers.

Dry Senile Arthritis.—As described by Poncet, this is the type of arthritis deformans which we see in old people.

Ankylosing Tubercular Rheumatism.—True rheumatism never leads to an ankylosis. Poncet states that a spontaneous ankylosis is the result of an infection which involves the ligaments or the bones; but one structure is never involved to the exclusion of the others, and between the extremes all transitional forms occur.

It is the current opinion that gonorrhœal rheumatism presents to the greatest degree the power of producing an ankylosis without the formation of pus. Poncet challenges this; according to him many of the so-called ankyloses are tubercular, and he calls particular attention to the different varieties of ankylosis in the spinal column.

Ankylosing tubercular rheumatism is associated with a mild chronic visceral tuberculosis, rather than with an active process, and a careful search is often required to demonstrate these latent lesions. As a rule there is a tubercular family

history, or a history of prolonged exposure to such an infection; sex seems to have no influence; children are often attacked; the vertebral form is confined to maturity and old age.

There are two clinical forms: monarticular and polyarticular.

The monarticular form occurs in the larger joints, most often the hip or knee. The process of ankylosis may be rapid, without intermission; at completion all pain ceases. Again the process may be gradual but irregular, with improvements and relapses, terminating usually in a complete ankylosis.

The onset of the polyarticular form may be insidious or brusque, with chills, fever, sweating, and rapid loss of weight. Several articulations may be involved; the pain and tenderness persist for a considerable period after the subsidence of the onset; there is a great tendency for the parts to assume faulty positions, and the end result may be a fibrous or bony ankylosis.

The following cases are quoted by Poncet as being good clinical examples of the condition.

CASE I.—Male, aged 32; mother died of phthisis; no family history of rheumatism. At ten, the patient had an acute attack of rheumatism, involving all the articulations of the body. The acute stage was unduly prolonged, and the patient was left with an adducted thigh which suggested an arthritis of the hip. At fourteen he had another severe attack of acute articular rheumatism, involving all the large joints and the vertebral column. This condition persisted, and for two years the patient was a constant sufferer. In his sixteenth year the pain gradually lessened but the joints became ankylosed and deformed. The presence of a generalized ankylosis destroyed his power of walking. Two years later he had a sudden hæmoptysis, and examination demonstrated an apical phthisis.

CASE II.—A young woman, aged 32; father died of tubercular laryngitis. The patient was married at twenty-two years. Shortly after this her husband developed pulmonary tuberculosis and died eighteen months later; during this time she had taken personal care of him. Three years later she married again; four months later her second husband died of pulmonary tuberculosis. Although constantly exposed to tubercular infection, she remained in good health for three years, then without any appreciable cause she began to suffer from erratic arthralgias

of all the joints, but there were no chills, fever, or local signs of inflammation. The salicylates were of no benefit. These irregular pains continued for eight years. At the end of this period she was suddenly seized with an attack of acute articular rheumatism. After three months in bed the pain subsided, but she was left with a complete ankylosis of the elbow and wrist, and an incomplete ankylosis of the right plantar arch and knee. On resecting the elbow the bones were found to be fused together, and there was no line of demarcation; clearly showing that the irritative process had been of long standing. There was a progressive deforming ankylosis of the fingers; from time to time indefinite arthralgias and a rebellious coccydynia. These signs are not those of a classic tuberculosis, visceral or otherwise, yet there was a tubercular lesion at the right apex and she reacted to tuberculin.

Lorenz (1904) reported on the frequency of the occurrence of rigidity of the spine and its relation to pulmonary tuberculosis. The following figures were the results of investigations carried out at Bad Oppelsdorf: Of 667 cases of spinal rigidity, 174 cases (24 per cent.) had pulmonary tuberculosis. Of these 667 cases, 168 had abnormally stiff spines and of these 68 (40.5 per cent.) had phthisis. Of the 174 tubercular cases, 68 (39 per cent.) had stiff spines. According to Mosse, 70 per cent. scoliotics in the young are tubercular. These figures are taken from Senator's clinic and represent the study of 89 children between the ages of six and fifteen.

Bachmann, in reporting on the changes in the internal organs in marked scoliosis, gives the following figures obtained from the autopsy records of the Breslau Pathological Institute: In 197 cases of scoliosis, 56 cases (28 per cent.) had pulmonary tuberculosis; of these 56, 39 were recent cases, 17 old cases; in the 20 severe cases 35.7 per cent. had tuberculosis; in the 36 mild cases, 64.3 per cent. had tuberculosis.

Cotte concludes that 60 per cent. of scoliotics present manifestations of tuberculosis.

ABARTICULAR TUBERCULAR RHEUMATISM.—Having described the tubercular rheumatism occurring in the joints as articular rheumatism, Poncet uses the term abarticular rheumatism to cover the manifestations of tubercular inflamma-

tion in other tissues and organs. Pathologically, these manifestations may be purely congestive, inflammatory, or sclerotic in nature.

The fleeting character of the lesions, their wide distribution, and the mildness of the tissue reactions in the majority of the cases suggest the acting of a toxin rather than a bacillus.

Poncet takes up cardiac, pleural, cerebral, glandular, gastro-intestinal, genito-urinary, ocular, cutaneous, and tendofibrous rheumatism. To cover each individual form would lead us too far. I will confine my remarks to a few of the most important ones.

The influence of the toxins of different diseases on the nervous system would make an interesting and instructive study. Many of the foremost creative geniuses of the world have been sufferers from tuberculosis. Yet in spite of this malady, with its numerous drawbacks and discouragements, we find instead of a melancholy atmosphere an air of helpful cheerfulness. This suggests the possibility of a mental stimulation by the toxins. The neurasthenia of tubercular subjects is too well known to need comment. Hollós has suggested that the toxins derived from a hidden focus may act on the nervous system through the sympathetic. Poncet, after calling attention to the frequency of tuberculosis in patients with exophthalmic goitre, suggests the possibility of the actions of the tubercular toxins on the sympathetic system. Omitting the indefinite pains described as arthralgias, ostalgias, and myalgias, we still find numerous cases of neuralgia among the tubercular; of these neuralgias, sciatica is by far the commonest. According to Courmont and Vallery, 25 per cent. to 30 per cent. of sciatica patients are clinically tubercular and 91 per cent. of them react to serodiagnostic means. The possibility of rheumatic chorea being of a tubercular nature must be kept in mind if the patient is to receive the proper treatment.

Poncet suggests that the causes of certain indefinite car-

diac, respiratory, and digestive symptoms may have their origin in the intoxication of the pneumogastric nerves or the sympathetic system.

Ocular manifestations: The most frequent of all the ocular manifestations of tubercular rheumatism is tubercular rheumatic iritis. This is not the classical tubercular iritis. In this connection it is interesting to note that Parker (1911), in his hand-book of diseases of the eye, calls attention to the investigations relating to the possible tubercular origin of some of the forms of inflammation that attack the sclera.

Gastro-intestinal tract: A great many of the inflammatory stenosing tumor-like lesions of the pyloric region are said to be examples of tubercular inflammation. Poncet, Leriche, Mouriquand, and Leclerc have contributed reports of such cases. The latest communication is an admirable study of Charlier and Nové-Josserand. They conclude that the lesions which they have studied approach so closely those described as congenital hypertrophic stenosis of the pylorus, that it is justifiable to demand if the same pathogenesis (tubercular inflammation) does not apply to them.

Before the Tuberculosis Congress at Naples in 1901, Patella presented three cases of pyloric stenosis occurring in tubercular individuals, not caused by ulcers or direct tubercular lesions, but being caused by a fibrous inflammation of the pylorus and the surrounding tissues. Romani, in 1904, described two more cases and called the condition "Patella's disease."

Skin: According to Poncet, the cutaneous manifestations are legion. It is difficult to give a systematic account of them. He includes Bazin's disease (indurated erythema occurring in scrofulous patients), erythema nodosum, and many of the atypical tubercular cutaneous manifestations as abarticular localizations of tubercular rheumatism.

Muscles: The myalgias and fibrous muscular thickenings occurring in tubercular cases are considered as being tubercular in origin.

Fascia: Sclerosis of fascia and fibrous tissue is often suggestive of a tubercular influence. Poncet quotes the following figures: in 100 cases of campto-dactylitis, 87 were clearly tubercular, 7 probably tubercular, and 6 were free from tuberculosis, that is 87 to 94 per cent. were tubercular, and he concludes that this deformity is a veritable stigma of tuberculosis.

Many of the Dupuytren's contractions and contractions of the plantar fascia are considered by Poncet to be caused by a tubercular inflammation.

Diagnosis.—"The diagnosis is often a matter of clinical impression rather than a well-ordered deduction" (Tixier).

This impression must be verified by an accurate family and personal history, a study of the attacks, their duration, resistance to therapy, tendency to recurrence, and all other toxi-infectious agents must be excluded. The urethral secretions should be examined microscopically and the complement deviation test for gonorrhœa should be applied. All the usual laboratory tests for tuberculosis can be tried. Poncet favors Arloing and Courmant's serodiagnostic agglutination test. Close watch should be kept for any external or internal signs of tuberculosis.

To sum up, Poncet says: "In the presence of rheumatism, the first thing we should do is to demonstrate that it is not tubercular; knowing the frequency of tuberculosis and tubercular rheumatism, we should think pathogenetically rather than pathologically."

Prognosis.—The prognosis of tubercular rheumatism has to be considered from two points of view, from the rheumatic and from the tuberculosis which accompanies or produces it.

The prognosis is variable with regard to the rheumatism. Generally speaking tubercular rheumatism occurs in the milder forms of tuberculosis.

Treatment.—The great value of the diagnosis is the key it gives to the correct treatment. Instead of placing the patient on a restricted diet and dosing him with useless diges-

tion destroying salicylates, we can plan the treatment on broad hygienic lines.

The general treatment is that of tuberculosis: fresh air, sunlight, forced feeding, cod-liver oil, tonics, etc.

The object of the local treatment is to protect the acute joints and prevent the development of a true tubercular arthritis; all active forms should be regarded as pre-tubercular lesions. In the chronic forms ankylosis and deformity are to be guarded against; if already present, they should be treated according to general surgical principles, due weight being given to their tubercular nature. In the acute attacks Poncet speaks highly of the use of cryogenine; it has the same effect in tubercular rheumatism that the salicylates have in true rheumatism.

In conclusion I will say that my original intention was to present to this Society the results of a clinical study on tubercular rheumatism, but in the course of the work I soon realized that it would be better to present Poncet's personal views and statements with the object of bringing out a frank and free discussion. A knowledge of Poncet's conception is of great value in diagnosis, and when we are face to face with so-called rheumatism we would do well to make an earnest endeavor to test its worth.

A complete bibliography up to July, 1903, will be found in Poncet and Leriche's monograph, *Le Rhumatisme Tuberculeux, L'Oeuvre Medico-Chirurgicale,* Critzman, No. 34, Masson et Cie., Paris, August, 1903. From August, 1903, until March, 1909, the literature will be found in Poncet and Leriche's book, *Le Rhumatisme Tuberculeux,* Octave Doin et Fils, Paris, 1909. Poncet and Leriche are shortly to publish a volume entitled *La tuberculose inflammatoire.*

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, held February 14, 1912.

The President, Dr. Charles L. Gibson, in the Chair.

MEMBRANOUS PERICOLITIS.

Dr. Parker Syms presented a girl, 17 years old, who was admitted to the Lebanon Hospital on December 24, 1911. She was born in Roumania and gave a negative family history. Her menstruation began when she was 12 years old, and had been regular and uncomplicated. Until one year ago the patient had been in good health, except for the fact that she had suffered from chronic constipation, having to depend on cathartics. A year prior to her admission to the hospital she had a sudden attack of cramp-like pain which localized itself in the right iliac region, and which persisted between one and two weeks. Since then she had had four similar attacks, each accompanied by vomiting. The last one, which occurred a month ago, was the most severe.

The case was regarded as one of appendicitis, and the patient was operated upon on December 27, 1911. Through a small, gridiron incision the appendix was delivered and removed. On account of the insignificance of the appendicular lesion, as compared with the severity of her attacks, and on account of her chronic constipation, a further inspection was made. There was no "Lane kink," but the ascending colon, from the cæcum up, was enveloped in a typical Jackson's membrane. This extended from the parietal attachment of the peritoneum across the colon, covering about two-thirds of its circumference. The colon was apparently movable within this membrane, which appeared to be

separated from the colon by a space or by œdema. The membrane was incised along the border of the flank and then removed from the colon, to which it was found to be lightly attached. The separation left a slightly bleeding surface, but it released the colon, leaving it free and movable.

The patient made an uneventful recovery from the operation, and since then has been constantly gaining in health. At present her bowel function is nearly normal, and it would seem as though she has been cured of this cause of chronic constipation.

DIVISION OF THE ULNAR NERVE: SECONDARY NEURORRHAPHY.

Dr. Syms presented a man, 35 years old, who was admitted to the Lebanon Hospital on December 27, 1911, with the history that five months prior to his admission he had been cut just above the right elbow by a piece of glass. The wound had been sutured by a physician, and had promptly healed. From the time of the injury, however, there had been a loss of those functions supplied by the ulnar nerve: there was slight atrophy of the interossei groups and of the adductor muscles of the thumb, together with trophic changes in the skin of the little finger and the ulnar side of the ring finger. There was also loss of touch and pain sensations extending from the finger-tips to the wrist-joint. In other words, there was evidence of complete severance of the ulnar nerve. At the site of the wound the usual bulbous swelling could be felt. This was the neuroma which is always found at the proximal end of a divided nerve.

Operation, January 3, 1912: The nerve was exposed above the condyle. There was quite a large bulb at the end of the upper segment, and the two segments were connected by a fibrous cord. Nerve suture was accomplished by Brun's method, that is to say, the fibrous cord was split longitudinally, and the incision carried up and down into the neuroma of each segment of the nerve. Then the halves of the fibrous cord were stretched laterally, and interrupted sutures were applied in pairs until the nerve-trunks were brought in apposition. This point of juncture was closed by folding the redundant portions of the fibrous cord over it and suturing them together.

The patient made a satisfactory recovery, the wound healing by first intention. There was already, apparently, a slight im-

provement, although it was too early for restoration to have taken place. Dr. Syms said he hoped to show the patient again at a later period, when the final result might be known.

STONE IN THE COMMON DUCT: BILIARY FISTULA.

DR. SYMS presented a woman, 37 years old, who was admitted to the Lebanon Hospital on November 6, 1911. Her family history was negative, and her past history, with the exception of an attack of malaria nine years ago, was unimportant.

Eight months ago the patient was operated on by Dr. Syms for severe gangrenous cholecystitis. The gangrenous gall-bladder, which contained a large number of stones, was removed, and three large stones were removed from the common duct, which was then drained by a tube leading to the surface. At the time of this operation the patient was in a desperate condition, and complete exploration of the duct was evidently not accomplished, for undoubtedly a stone was left at its duodenal end. The patient made a satisfactory operative recovery, and left the hospital in restored health, but with a fistula persisting at the site of the drainage tube.

When the patient was readmitted in November there was a biliary fistula discharging greenish bile; her stools were clay colored, and it was assumed that there must be some obstruction to the common duct. The final operation was done November 22, 1911. The abdomen was opened to the inner side of the sinus, and the latter was dissected from the abdominal wall. This sinus consisted of a fibrous tube which could be clearly demonstrated, and which was entirely separated from the abdominal contents by blunt dissection. It formed a T-shaped communication with the common duct about its middle. A large stone was found in the common duct near the duodenum, which was removed by opening the duct. After this the duct was found to be clear in each direction, and the new opening into the duct was closed. The old sinus was resected, but was left attached to the peritoneum. Immediately after the operation the patient began to show bile in her stools. Her wound closed satisfactorily, and she made a complete recovery.

Dr. Syms said he reported this case on account of the complete new duct which had formed around the rubber drainage

tube, which was used at the time of the first operation. This new duct consisted of a fibrous tube of such definite structure that it could have been utilized to make an anastomosis with the intestine, should such a procedure have been necessary.

A NEW METHOD FOR OPERATING UPON VOLUMINOUS CÆCA OR CÆCUM MOBILE.

Dr. Joseph A. Blake presented a patient illustrating this method. The condition for which this patient was operated upon presents a well-defined symptom complex in which the major symptom is pain in the right lower quadrant occurring in ill-defined attacks and always associated with gas. There is also as a rule constipation, and in many cases general evidences of intestinal auto-intoxication. There may be a more or less well-developed colitis. Upon examination of one of these patients one finds evidences of distention of the cæcum marked by tympany and splashing, and usually the balloon-like cæcum may be felt or even seen. Radiography with the aid of bismuth shows the cæcum to be large both in diameter and in length, to often hang into or lie in the true pelvis, and that it fails to empty itself in the normal period.

Upon operation the cæcum is found to have a more or less free mesentery and to be more than usually movable. Hence the term cæcum mobile, which is usually used to describe the condition. The chief characteristic, however, is not its mobility, but rather its size, therefore the term voluminous cæcum is suggested as a better one. And it will be found that the symptoms are better explained on the hypothesis of an atonic dilatation as the cause rather than mechanical obstructions due to kinks arising from its mobility.

What the cause of the condition is, is not altogether clear, but it is frequently associated with general enteroptosis, and undoubtedly developmental errors are the chief factors in its production.

The failure of the large intestine to conform to environment and the secondary changes produced by habit, namely, atony, distention, and catarrh, are jumbled in an etiological mess.

The operation performed upon this patient is based upon the theory that the symptoms are caused and the condition perpetuated by the enlargement of the cæcum, leading to stasis and

fermentation and the production of gas, which in turn, by overdistention, increases the atony and the inability of the cæcum to empty itself. Conversely, unless these mechanical conditions are well defined, the operation is not indicated.

The operation consists, after removing the appendix and inverting its stump, in inverting or plicating the wall of the cæcum by a continuous Cushing suture of linen or silk, commencing at the site of the appendix and uniting the ventral and lateral tæniæ or striæ musculares together aborally along the ascending colon for a sufficient distance, usually four to five inches, to produce the desired effect. As the continuous suture is introduced and drawn tight, the length and therefore the pendulousness of the cæcum is diminished as well as its calibre. The striæ musculares afford firm tissue to support the suture, and it will be found to be a safe and secure procedure.

The post-operative convalescence of this patient and the others so far operated upon, some seven or eight in number, has been perfectly smooth and there has been an exceptional freedom from gas pains.

The radiographs taken after the operation show that very little bismuth enters the cæcum, and that it remains in a normal position.

How long the suture will effect this result has to be ascertained. The removal of the portion of the cæcum inverted has been considered, but this would add considerable risk and might jeopardize the contractility of the cæcum that is so important to preserve.

Among the rather extensive literature upon cæcum mobile only one reference has been found in regard to plication, namely, Klemm, *Archiv. für klin. Chir.*, July, 1911, p. 558, and he does not state the method he employs.

The clinical data of the patient presented were briefly as follows:

R. J. S., married woman, 29 years of age. Admitted to Presbyterian Hospital, November 29, 1911, suffering from pain in lower left abdomen and attacks of indigestion accompanied by gas. She has had two children, one miscarriage, and was said to have had "falling of the womb." Upon examination the abdomen was found moderately lax, with tenderness in the lower left quadrant. Per vaginam, the cervix was soft, with a

slight laceration of the left side. The uterus was tipped sharply backward into the hollow of the sacrum. It was movable, but motion caused pain. She was operated upon on December 4, 1911. The abdomen was opened in the median line with intention of doing a ventral suspension and correcting conditions that might be found in the left ovary. The uterus was found sharply retroverted and a cystic condition of the left ovary, which was partly removed. The appendix was found to be long and slightly swollen. There was a constriction about 2.5 cm. from its base. The cæcum was low down in the pelvis, freely movable, and very large. The appendix was removed, its stump inverted, and the cæcal wall plicated in the manner already described. The uterus was suspended by Gilliam's method. The post-operative convalescence was smooth, with a moderate amount of gas pains. X-rays with bismuth two weeks after operation showed the cæcum to be in good position and only containing a small amount of bismuth. The patient's condition since leaving the hospital has been much improved. Some of the improvement in her case must be laid to the correction of the uterine condition and removal of the cystic ovary, and it is problematical how much can be attributed to the plication of the cæcum: yet the patient states that her digestion is better and she has more freedom from gas than she has experienced for a long time. Her constipation has been entirely relieved.

Dr. Clarence A. McWilliams said he had done this operation in about five cases. It was easily performed, without any danger to the patient, and he considered it well worthy of imitation, as it certainly produced a marked diminution in the lumen of the cæcum, reducing the dimensions of the gut in both its transverse and vertical diameters.

Dr. Henry H. M. Lyle said that after careful observation and measurement of these cases of voluminous cæca during the past year, he had found that the condition varied widely, and as in some instances it gave rise to no symptoms whatsoever, it was at times difficult to determine what to do. As Clark of Philadelphia had put it, we must be led to operate, not by the size of the gut, but by the symptoms that the condition gave rise to. Another point in connection with these cases was that the patients required careful supervision after operation in regard to their food, abdominal exercise, hygiene, etc.

The proper selection of these cases for operation, Dr. Lyle said, as well as the best method of operation, was still unsettled. Some men were in favor of plication, rendering the cæcum less movable, while on the contrary one surgeon had advocated a method to make it more movable. There was considerable latitude to the movements of the cæcum within physiological limits, especially in women who had been pregnant.

Dr. Blake said he did not mean to imply that by the method he had described we had reached the ultimate solution of this problem, but he did not believe that the mobility of the cæcum had anything to do with the symptoms. These depended on the amount of dilatation of the gut and its consequent atonicity. The operation was simply an attempt to prevent the cæcum from becoming over-dilated and the vicious chain of symptoms that followed such a condition.

Dr. A. V. Moschcowitz asked what the relationship was, if any, between the so-called cæcum mobile, typhlotomy, and the condition described by Dr. Syms under the name of Jackson's membrane? In the latter condition, the cæcum was bound down, and the membrane was loosened, while in the condition described by Dr. Blake the cæcum was too mobile, and was fastened. In the one class of cases the symptoms were attributed to the fact that the cæcum was bound down, while in the other they were attributed to the fact that it was too mobile, and yet the symptoms complained of by these patients were practically the same. This whole problem, the speaker said, was an exceedingly intricate one, and the more he had tried to get it clear in his mind from the literature, the more confused did the clinical picture and pathology of these cases become.

Dr. Charles H. Peck said he thought Dr. Blake had already answered Dr. Moschcowitz in his statement that it was not the mobility of the cæcum as much as its size and atonicity that he had aimed to remedy by this operation. In these cases this enormously dilated cæcum was present, which formed a reservoir for the fæces and which was unable to empty itself, and this condition, he thought, could be much improved by plication of the gut. He considered the operation described by Dr. Blake as an important step in the right direction in dealing with these cases.

Dr. Blake, in closing, in reply to a question said the mesocolon of the cæcum was not interfered with in the slightest

degree. The true cæcum—that part beyond the ileocæcal valve—was shortened. The speaker said that the term cæcum mobile was a misnomer, inasmuch as the condition was one of the ileocolic junction and the ascending colon in addition to the cæcum.

As to the presence of the so-called Jackson's membrane, Dr. Blake said that it was present always and was, in fact, a normal structure.

In answer to a question as to how the operation he had described relieved this condition of cæcum mobile, the speaker said that while it did not increase the muscular tonicity of the gut, it prevented the accumulation of fæces and thus relieved the stasis in this part of the colon.

HYPOPITUITARISM OF THE FROHLICH TYPE.

Dr. F. Kammerer presented a boy, 22 years old, who had been ill for the past eight years. This illness began with headaches and a slowly increasing impairment of vision, which had gradually in spite of treatment developed into absolute blindness in one eye and temporal hemianopsia in the other, with the bare possibility of recognizing fingers on the nasal side. The patient was only four feet and five inches tall. There was no unusual development of the bones of the head or extremities. Adiposity and pallor were well marked. No hair had developed on the pubes or chest, or in the axillæ. The external genitals were very small. There was no polyuria.

The X-ray pictures showed a marked enlargement of the sella turcica, with complete obliteration of the dorsum. Dr. Kammerer said this case was one of marked infantilism, with tumor of the hypophysis—the rather rare type—and he expected to report it more extensively later on.

CLEFT PALATE: LANE'S OPERATION.

Dr. Frank S. Mathews presented a child, five years of age, on whom he had operated for a wide cleft of the hard and soft palates two months ago. The cleft did not include the alveolar border. The case was shown because of the unusually good result, especially in the soft palate, there even being a well-formed uvula.

In operating on this case, Dr. Mathews said, the Lane method had been employed. The hinge flap had included the whole of

the mucoperiosteal covering of the hard palate, and had extended laterally over the alveolar border to the juncture of the jaw and cheek. On the "pocket flap" side, the undermining of the soft palate, after making the incision well laterally on its upper surface, permitted this flap to spread out well across the gap. By getting such wide flaps, the sutures could be inserted without tension, and there was wide overlapping.

The child's parents thought that the speech had improved somewhat since the operation.

Dr. Charles N. Dowd thought the case presented by Dr. Mathews was a remarkable example of uranoplasty. At the present time the child's mouth could be inspected without distinguishing that there had been a cleft palate, as the uvula and soft palate were in such perfect condition. This might well be made a test case, and might furnish a good deal of information to the members of the Surgical Society.

The mother was intelligent and willing to aid the child in learning to speak properly, and he hoped the patient would be shown before the Society after a lapse of two years. There was a good deal of uncertainty about the ultimate result in cases that were treated by the Lane operation. A recent article by Berry in the *British Medical Journal* called particular attention to the poor power of speech which followed these operations. We did not yet know whether children learned to speak as well after this operation as after the Langenbeck operation. Berry was confident that they did not. Incidentally we must bear in mind that the mortality rate for doing this operation on very young children was larger than had frequently been supposed. Berry indicated that this was really somewhere from 12 per cent. to 40 per cent. if we watched the child for a few months after operation.

Dr. William A. Downes said he thought the Lane operation for complete cleft palate and harelip should not be done at one sitting. The harelip should first be repaired, immediately after birth, and then, after three or four months, when the nutrition of the child had improved, the Lane operation could be completed. The lip does not in any way interfere with the palate operation and has the great advantage of the completed alveolar arch.

Dr. Downes said he had done this operation in 15 or 20 cases. In several of these two years or more had elapsed, but he was

still uncertain as to their ultimate outcome as regarded articulation. While the appearance of the soft palate was very satisfactory at the outset, it often became shrunken in the course of time, even to the extent in some cases of allowing regurgitation.

DR. CHAS. L. GIBSON said that one small but important point in the technic of this operation was the use of the Reverdin needle for passing the sutures—a small-sized needle, with a very full curve.

DR. MATHEWS, in closing, said the child he had shown was now being taught to enunciate the letters of the alphabet, and he hoped that under proper supervision the articulation would improve.

In Lane's article on this operation, Dr. Mathews said, no mention was made of the mortality, which he thought must be very high. One of the most important factors in connection with the operation was the element of time: in this case, the operation lasted one hour, which should be about the average time. He recalled one case where the operator took fully three hours.

RETENTION OF URINE DUE TO ADHERENT APPENDICAL STUMP.

DR. MATHEWS presented a man of 50, who first came under observation at St. Francis Hospital 18 months ago. He was then suffering from complete retention of urine and cystitis, soon followed by a rise of temperature and hypogastric pain. Repeated examinations showed no cause for the retention either of nervous or mechanical origin. For some time he was treated by irrigation and perineal drainage. This resulted in some improvement, and he was able to void urine voluntarily, but with from 15 to 20 ounces residual, and he left the hospital in this condition.

In the spring of 1911 he suffered from an acute appendicitis, for which he was operated on, and during this operation, Dr. Mathews subsequently learned, many adhesions were encountered about the appendix, with little or no pus, and a hemorrhage occurred which was so profuse that the wound was hurriedly packed and the operation abandoned.

Last August the patient was again admitted to St. Francis Hospital, in the service of Dr. John Rogers, and was operated upon by Dr. Mathews. At this time there was a small sinus, which had remained since the date of the previous operation on

the appendix. The patient complained at times of severe hypogastric pain, and had almost complete retention of urine. The sinus was found to pass down between two coils of small intestine, and proved to be the termination of the appendix, the tip of which had been drawn through a hole in the mesentery of the small intestine. This probably explained the hemorrhage that had been encountered at the former operation: the operator had torn the mesentery in approaching the appendix, and had drawn the appendix through the perforation. There was also a band about the size of a lead-pencil running from the distal part of the appendix across to the vault of the bladder, which was doubtless the cause of the inability of the bladder to contract. This band had a lumen and seemed lined with granulation tissue. It was removed, together with the appendix, and an over-lapping operation done on the abdominal wall.

At the present time, six months after the operation, the bladder was still of large capacity, with five or six ounces of residual urine. However, the man's cystitis as well as his general health were much improved and he complained of no symptoms.

ARTHRITIS DEFORMANS OF THE HIP: ALBEE'S OPERATION.

Dr. Henry H. M. Lyle presented a man, 59 years old, who had suffered from arthritis deformans of the right hip for seven years, and whose condition had steadily grown worse. He was admitted to the medical side of St. Luke's Hospital, and after various therapeutic and orthopædic methods had failed to give him relief, he was transferred to the surgical side for operation. At this time he was helpless and bed-ridden.

Examination showed an increase in the bony elements about the hip, with marked atrophy of the corresponding thigh and calf muscles. The right leg was flexed, adducted, and rotated inward, abduction and extension being practically impossible. There was moderate tenderness over the hip, and distinct crepitus could be elicited. There was a practical shortening of an inch and a half. The skiagraph showed a typical arthritis deformans. The Wassermann and tuberculin reactions were negative.

On September 26, 1911, Dr. Lyle did an arthrodesis of the right hip according to the Albee method.

After a preliminary tenotomy of the adductors the hip-joint was exposed by a five inch incision, beginning just below the

anterior superior spine and running downward and inward parallel to the inner border of the sartorius. After retracting the sartorius outward, the intermuscular space between the tensor fasciæ femoris and rectus was separated by blunt dissection, thus uncovering the femoral neck. The surrounding ring of osteophytes was removed and the overhanging portion of the acetabulum was chiselled away, thus converting it into a flat bony roof. With the head *in situ*, a corresponding portion was removed from the upper surface of the head. The leg was rotated outward and as much of the cartilage as possible was removed from the surface of the head and acetabulum, the flat bony surfaces were brought in contact by abduction, and the wound closed without drainage. Both legs were enclosed in a double plaster spica extending from the thorax to the toes on one side, and to the knee on the other; just above the knees an iron cross-bar was inserted.

The patient although recently operated on has a firm painless ankylosis. Dr. Lyle presented him as an example of the value of Albee's operation. After an experience of four years with this operation, Dr. Lyle considers it to be a marked advance in the treatment of the mono-articular type of osteo-arthritis and as such it deserves a more extensive trial than it has received.

Dr. Fred H. Albee said that in these cases the outward rotation was the most difficult element to overcome, together with the prevention of the recurrence of adduction. Of course, there is always a deformity of long standing to deal with, namely, adduction and flexion. Even the application of plaster-of-Paris was insufficient to overcome the adduction, and in order to strengthen the plaster the speaker said he had resorted to the use of U-shaped bands of metal extending from the pelvis to the knees, which were put in under the final layers of the plaster and allowed to remain until the plaster hardened, both thighs in this instance being included in the plaster cast, in abduction.

Speaking of the operation itself, Dr. Albee said he had done it 28 times. Twenty-three of these were in cases of osteo-arthritis and five in tuberculosis of the hip, and he was as well pleased with the results in the latter as in the former. The osteophytes or overgrowth of bone that came down over the neck of the femur must not be overlooked, and he could recall several cases where the operator had cut off too much of the head of

the bone, having been misled by the appearance of the osteophytes. They should be removed first, and then a part of the rim of the acetabulum, thus laying bare the head, of which about one-fifth should be removed. All the cartilage should then be removed from the remaining four-fifths of the head, which could be done by strongly rotating the femur outward.

Dr. Albee said that the function of a stiff hip-joint in good position was often surprisingly satisfactory—more so than a stiff knee, because in the hip we had the spine to compensate for the loss of motion. That motion took place only two inches above the normal hip. The speaker said that the more advanced the cases of osteo-arthritis, the quicker the ankylosis.

LE RHUMATISME TUBERCULEUX (PONCET).

Dr. Henry H. M. Lyle read a paper with the above title, for which see page 750.

Dr. Walton Martin, referring to the theory of Poncet that the tubercle bacilli produced at times simple exudative inflammation in joints, said that Dr. Prudden, in his work on pathology, called attention to the fact that the tubercle bacilli produce not only the characteristic tuberculous inflammations but also simple exudative inflammation.

Discussing the terminology of this affection, Dr. Martin said that if we agreed that the joint lesions are due to tubercle bacilli, then it would be a misnomer to call the disease rheumatism: the condition would then be one of tuberculosis, and not rheumatism. The speaker said he was much interested in this theory of Poncet, and he felt that more careful investigation along this line would lead to very interesting results.

Dr. Lyle, in closing, speaking of the terminology of this condition, said the same objections were made in connection with gonorrhœal rheumatism, gout, etc. Poncet's theory was now practically accepted in France and other parts of Europe, and while the name *le rhumatisme tuberculeux* was rather unfortunate, as Dr. Martin said, still it was the name Poncet had adopted, and by that term the morbus Poncet was generally understood.

In many of these cases, Dr. Lyle said, the affection was regarded as a pre-tuberculous condition by Poncet and others, and this gave it added significance. Poncet's investigations along these lines had been very thorough and extensive, and for that reason he deserved great credit.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, held February 5, 1912.

The President Dr. Gwilym G. Davis, in the Chair.

ARTHROTOMY FOR ELBOW LUXATION.

Dr. Edward B. Hodge exhibited a patient to show the result one year after arthrotomy for postero-external luxation of the elbow.

Male, 49 years of age, switchman, had his right arm amputated at the wrist following a crush 14 years ago. Six weeks before his admission to the Presbyterian Hospital, March 8, 1911, he fell from a freight car upon his left arm, injuring the elbow. There was swelling and disability. As the swelling lessened, he became able to use the arm, except bending the elbow. When admitted to hospital, the left elbow showed nearly full extension, flexion limited to 160 degrees. The olecranon was out of line with the condyles and to the outer side as well as posterior. The head of the radius rotated behind and below the external condyle. The X-ray confirmed the clinical diagnosis of postero-external luxation. It also showed several loose pieces of bone, chiefly in the region of the external condyle.

On March 10, under ether, several attempts at reduction failed. An external incision was then made, extending from above the external condyle down on the forearm. The muscles were separated from the region of the external condyle, and on retraction toward the median line a good exposure was obtained. The head of the radius, well posterior and behind the external condyle, showed a crack extending one inch down the shaft. A loose piece from the external condyle was removed. After much difficulty the bones were replaced, using the handle

of an instrument as a lever. Muscles and ligaments were held in as nearly normal position as possible by chromic gut sutures. A cigarette drain was placed to the capsule, the skin closed with silkworm gut, and the arm dressed in acute flexion.

Convalescence was uneventful except for some numbness and tingling in the ulnar distribution. This is still present in slight degree. There was discharge of synovial fluid for 10 days, but no infection. Passive motion was begun early, and on discharge one month after operation the patient had at least 75 degrees of motion and could easily touch the back of his head with the palm of his hand.

The reporter emphasized the excellent exposure obtained by the external incision in dislocations of this type.

RESULTS IN THE TREATMENT OF FRACTURES OF THE FOREARM WITHOUT OPERATION.

Dr. Astley P. C. Ashhurst presented a paper in which were detailed the results obtained by treatment without operation in 52 cases of fracture of the forearm.

FRACTURE OF THE RADIUS ABOVE THE ATTACHMENT OF THE PRONATOR QUADRATUS MUSCLE.

Dr. Emory G. Alexander read a paper with the above title, for which see June Annals of Surgery.

OPEN OPERATION AND PLATING OF THE TIBIA AND FEMUR FOR RECENT FRACTURES IN A BOY OF TWELVE YEARS.

Dr. John H. Jopson reported the following case:

J. H., aged 12 years, was admitted to the Presbyterian Hospital November 6, 1911, with a history of having been run over by an automobile. Examination showed a compound fracture of the middle third of the right tibia, simple fracture of the right fibula, and a simple fracture of the middle of the shaft of the left femur. There was lateral displacement of the fragments of the tibia, and an oblique fracture of the femur, with overlapping of the fragments, outward bowing, and 1½ inches shortening. Three days later the right tibia was operated upon before some of the members of the American Congress of Clinical Surgeons, and a Lane plate used to fix the ends, after perfect approximation had been obtained by extension and manipulation.

FIG. 1.

Result after open operation and plating for compound fracture of tibia and fracture of femur in a boy of 12 years.

U of M

Superficial drainage was inserted and a plaster cast applied. Manual extension was used with the patient under ether, to overcome the shortening in the left femur, and lateral moulded splints applied in combination with Buck's extension. The operation wound healed without infection and with the fragments of the tibia in perfect position.

In spite of liberal weight extension to the left extremity, angulation and overlapping persisted in the fractured femur, with 1½ inches shortening. Nineteen days after the injury the left thigh was operated upon, when there was a large amount of callus already present surrounding the ends of the bone, and considerable union. The fragments were separated and extension was applied, using Dr. Eldridge L. Eliason's apparatus, which is a modification of that originally suggested by Dr. Edward Martin. In Martin's method strong extension is used to effect reduction, the extension being made directly over the upper end of the lower fragment, using a sterilized canvas band as a retractor. With Dr. Eliason's assistance the shortening due to muscular contraction was overcome, although there was some difficulty in maintaining approximation of the fragments after removal of the retractor, but with patience, satisfactory reduction was effected and a Lane plate applied on the outer side of the bone. The callus was so thick that the screws in the upper part of the plate did not penetrate to the solid bone, and longer screws not being at hand, it was deemed wise to reinforce the plate by passing a stout silver wire around it and the bone. The wire was then twisted and cut off short. The wound was closed with superficial drainage and a plaster cast applied, which included the pelvis.

Severe shock attended the latter stage of the operation, and the patient's condition for a time was very alarming, although hemorrhage had not been free, nor had the operation been unduly prolonged. The boy also developed a severe attack of erythema multiforma during his convalescence.

Primary healing occurred, and ten weeks after the accident the casts were permanently removed and union was firm in both tibia and femur. While the X-ray shows a slight overlapping in the case of the latter bone, the shortening is almost imperceptible, being less than one-half inch, and the functional result is perfect.

OPEN OPERATION AND PLATING FOR OLD FRACTURE OF BOTH MALLEOLI.

Dr. John H. Jopson reported also the history of a man, aged 28 years, who was admitted to the Presbyterian Hospital December 28, 1911. Six months before he had fallen a distance of 40 feet, catching his left foot between two uprights of an iron fence and fracturing his ankle. He was treated in a hospital in another city and wore a plaster cast for about two months. His ankle was greatly deformed, very painful, and he was unable to walk on it for any length of time, and was debarred from his occupation as a machinist.

An examination showed great inversion of the left foot, amounting to lateral dislocation, with displacement upward of the internal malleolus on the tibia, the external malleolus being turned inward at an acute angle. Flexion and extension were good, but lateral motion was abolished, and pain and disability pronounced (Fig. 2).

He was operated upon a few days later. An external incision over the fibula and external malleolus exposed the site of fracture, and the bone was divided at this point with an osteotome. A second incision was then made over the internal malleolus and inner surface of the tibia, the site of union between the two being exposed, and the malleolus was separated with an osteotome, following the line of union between the malleolus and shaft of the tibia. Attempts at reduction were made, but were resisted by the shortening of the tissues and upward displacement of the internal malleolus on the inner side of the ankle, and it was found necessary to remove a wedge of bone from the fibula at the site of the first osteotomy, after which the foot was forced outward into good position. A small Lane plate was applied over the point of division of the fibula to maintain correction, the upper edge of the internal malleolus having first been cut off where it was tilted widely from the shaft of the tibia. The limb was put up in a plaster cast. The wounds healed without infection. The cast was removed four weeks after operation, and union of the malleoli was then quite solid, the movements of flexion and extension were good, and a new cast was applied and the patient sent home (Fig. 3).

Dr. Astley P. C. Ashhurst said, in regard to the method

FIG. 2.

Fracture of both malleoli and internal dislocation of the ankle.

FIG. 3.

Result of open operation for fracture of both malleoli and internal dislocation of the ankle.

of securing extension in fractures of the femur for reduction of overlapping, he had used extension in the long axis of the leg by a compound pulley with a clove hitch above the knee in only three cases, and believes it is the best method, as one can get all the pull that the rope will stand. With the apparatus he employed a pull of 400 pounds was possible. This method well overcomes the shortening, making the limb longer by actual measurement than the normal, but makes the muscles so tense that one cannot feel the ends of the bones, and so cannot secure end-to-end apposition. In his first case, an ununited comminuted fracture which had been compound, and his second, a recent fracture, he operated, but even under ether and with the bone ends exposed he found extension by this method insufficient to reduce the fragments because the muscles were rendered so tense; but by putting an obstetrical hook over the ends of the fragments and angulating them until the ends met and then straightening them out again, reduction could be obtained without extension. In the third case he succeeded in getting perfect reduction by angulation over his forearm, without operation. They were all transverse fractures and therefore reduction, when once secured, was easier to maintain than is the case in oblique fractures.

Dr. G. G. Ross called attention to the statement Dr. Jopson made about the first case, that in any fracture of the femur in which the position was imperfect, and where he had to reinforce his Lane plate with a wire, he got prompt and satisfactory union, while in the tibia where he had perfect approximation he had delayed union. He had had this same thing happen many times to himself, where too perfect reduction with only a moderate degree of callus would be attended by delayed union.

Dr. G. G. Davis remarked, as directly bearing on the point raised by Dr. Ross, namely the delayed union in fractures with too perfect reduction and too little callus formation, he had a recent fracture of the femur in which early operative reposition was made. Seven weeks later he cut down to remove the wire, and there was nothing to be seen on the outside of the femur but a sharply defined black line of fracture, not a bit of provisional callus, and union firm, showing that apparently provisional callus is not essential to perfect union.

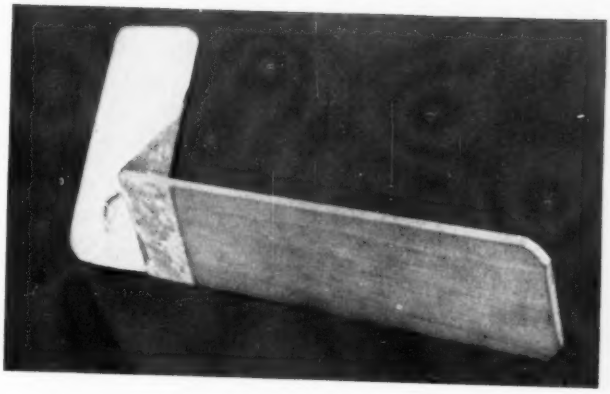
HOUR-GLASS STOMACH WITH PYLORIC STENOSIS.

Dr. John H. Jopson detailed the history of a woman, aged 35 years, who was referred to him by Dr. James E. Talley with a diagnosis of probable gastric ulcer and perigastric adhesions. She gave a history of gastric hemorrhages 15 years before and recurrent gastric symptoms 10 years later. Since that time she had suffered from repeated attacks of the same nature, and had been treated by routine medical measures; she was never entirely free from symptoms between attacks, suffering more or less constantly from pain, indigestion, and gaseous eructations and annoying hiccoughs. She was a semi-invalid, although pursuing by pressure of circumstances her occupation of stenographer.

The stomach contents after test meal showed an excess of hydrochloric acid, but no blood. Physical examination of the abdomen was practically negative, there being no gastric dilatation, no points of tenderness, no unusual muscular rigidity, and no tumor.

At the operation a typical hour-glass contraction of the stomach was found, which was produced by an old thickened ulcer about three-quarters of an inch in diameter, situated at the middle of the lesser curvature, and which had surrounded itself with numerous perigastric adhesions. These adhesions had resulted in a folding upon itself of the anterior stomach wall and an elevation of the same and of the greater curvature, with adhesion to the gastrohepatic omentum. The pyloric pouch was considerably larger than the cardiac pouch. An old smooth scar at the pylorus caused a marked stenosis at this point also. Gastrolysis was performed, careful dissection and division of the perigastric adhesions being sufficient to unfold the stomach until the lumen of the contracted portion was doubled and its patulousness insured. No plastic operation on the stomach wall appeared necessary, and posterior gastro-enterostomy to the pyloric pouch concluded the operation. The gastric symptoms were quickly relieved, and the patient has remained well, two years having now elapsed. She has gained in weight, digestion is good, and beyond an occasional hiccough, which is an explosive phenomenon to which she seems peculiarly liable, she exhibits no stomach symptoms.

FIG. 4.



Fulton's lateral angular splint.

DR. WILLIAM L. RODMAN called attention to the unreliability of skiagrams in cases of supposed hour-glass contraction of the stomach. He had known of four or five cases where the skiagram pointed to a well-marked condition of this kind, yet on exploration no approach at hour-glass stomach could be found. He did not know how to explain this, unless it be due to a temporary contraction of the gastric walls, but it is nevertheless a well-attested fact.

A LATERAL ANGULAR ELBOW SPLINT.

DR. Z. M. K. FULTON presented a new angular splint, saying that in the treatment of fractures of both bones of the forearm some form of angular splint, immobilizing the elbow, is advocated by many surgeons.

The chief objection to the internal angular splint is, that it gives a position of insufficient supination. Fractures, especially above the insertion of the pronator teres, are liable to be followed by incomplete supination when treated in this position. The anterior angular splint has the disadvantage of having to be applied to the rounded belly of the biceps muscle. If not carefully watched it is liable to "creep" downward and produce serious pressure upon the anterior surface of the forearm below the bend of the elbow. This position also is sometimes uncomfortable to the patient.

If a splint could be made to be attached to the inner surface of the arm and elbow, and at the same time retain the forearm in a position of sufficient supination, it would meet some or all of these objections.

The splint which he presented is very easily made by uniting the two parts with a piece of galvanized sheet iron or any other suitable metal, which can be shaped so as to give any degree of supination. A position of supination about midway between those commonly used is the ideal one. It brings the bones of the forearm in exactly the same plane, and each parallel to the surface of the splint. In this position also the greatest muscular relaxation is obtained (Fig. 4).

In actual use he had found this splint to be easily retained in position, very comfortable, and when combined with a short posterior splint, a very efficient dressing.

BOOK REVIEW.

MANUAL of CYSTOSCOPY. By J. BENTLEY SQUIER, M. D., Professor of Genito-Urinary Surgery, New York Post-Graduate Medical School and Hospital, and HENRY G. BUGBEE, M. D., Instructor in Genito-Urinary Surgery, New York Post-Graduate Medical School and Hospital. 117 pages with 26 plates. New York, Paul B. Hoeber, 1911.

This little manual is apparently designed as a primer of cystoscopy for students and is as brief and concise as such a book could well be. The history of the development of the cystoscope is first outlined, very briefly, after which the technic of the use of the instrument is taken up. A method of making a phantom out of a rubber ball for practice is described, the necessary preliminary procedures upon the patient and the instrument are detailed and the appearance of the normal bladder is given. Pictures of the pathological bladder follow and are briefly discussed, and a consideration of ureteral catheterization and cystoscopy in the female completes the book. There are a number of excellent color plates, but the book itself is little more than a syllabus and is hardly adequate to do more than direct the student's attention to the subject. Still its brevity may serve to emphasize the fact that a knowledge of cystoscopy is to be obtained by the examination of many bladders rather than of many books.

J. E. JENNINGS.

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